

BOTANIC GARDENS
and
NATIONAL HERBARIUM

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THE

AUSTRALIAN NATURALIST

Journal and Magazine
of

The New South Wales Naturalists' Club

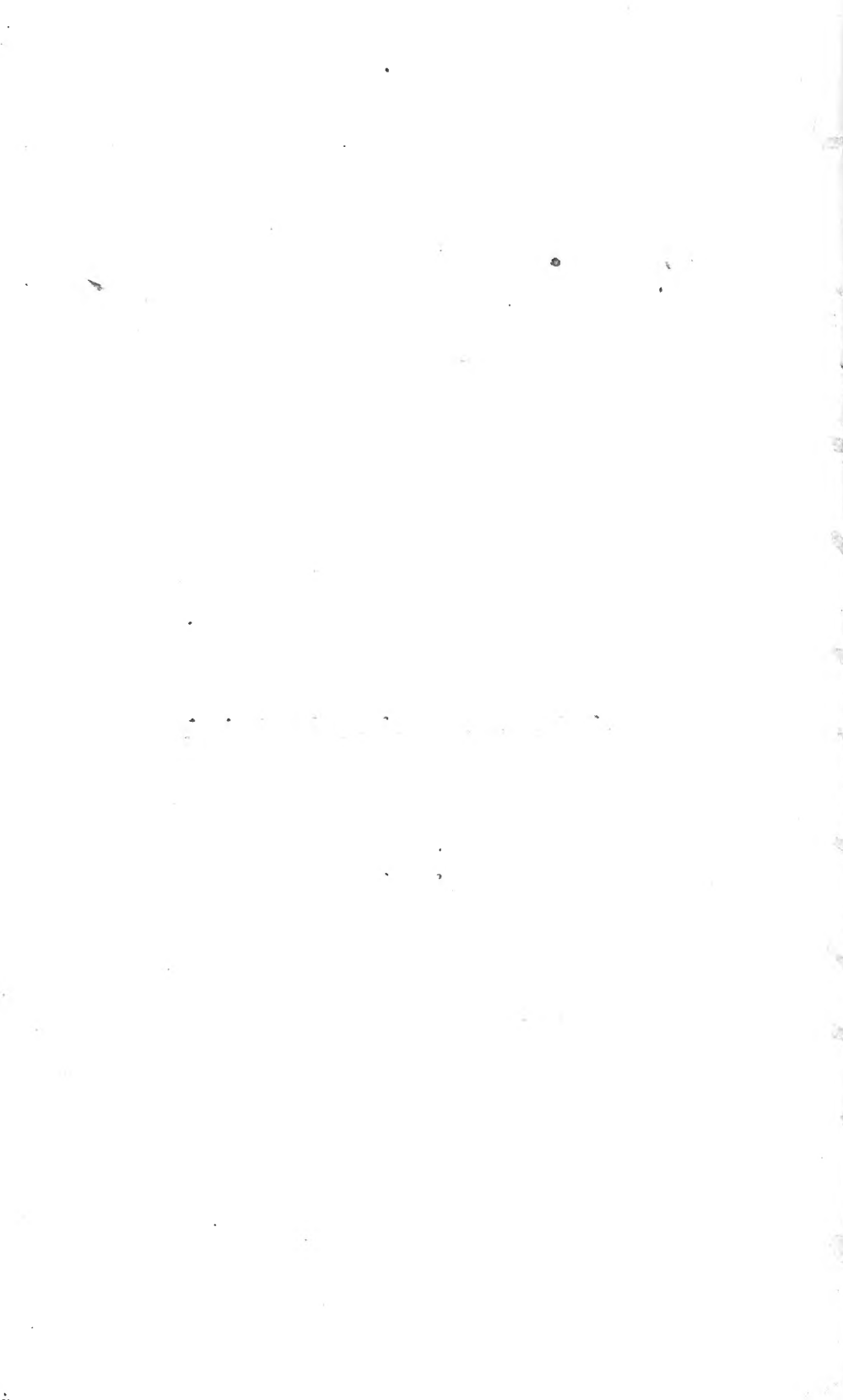
Edited by

W. J. Rainbow, F. L. S., F. E. S.

Vol. I.

1906 - 1909

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THE
Australian Naturalist

Journal and Magazine

of

The New South Wales Naturalists' Club

Edited by W. J. RAINBOW, F.L.S., F.E.S.



VOL. I.

SYDNEY, N.S.W.
S. D. TOWNSEND & Co., PRINTERS,

1906—9.

CONTENTS:

	Page.
Introduction	1
Annual Reports	2, 38, 90, 137, 186
Presidential Address...	4, 91, 187
Notes on Cuckoos	9
Pearls and Mother-o' Pearl	11
Obituary...	12, 73
Geographical Changes in Geological Times	14
A Beetle Hunt on Mount Kosciusko	17
The Geology of the Shoalhaven	26
Wattles of the County of Cumberland	28
Notes on Longicorn Beetle	30
Current Literature	30, 45, 190
Reports of Excursions	31, 150, 166, 180, 188
List of Members	34, 100
A Study in Natural Selection	39
Aquatic Insects in Salt Water	44
Destruction of Native Fauna	44
How the Australian Emu came by its Vernacular Name	50
Entomological Beach-Combing	58
Hints on Collecting Araneidae	60
A Collecting Trip through Fiji	66
Notes on the Birds of Fiji and other Islands	70
Natural History Classes	72
Entomological Prize...	74
N.S.W. Naturalists' Club, Armidale Branch	78

CONTENTS.—*Continued.*

Australian Insect Galls	...	...	...	79
Manner of Egg-Laying of Dragon-Fly (<i>Lestes</i> <i>Leda</i>)	...	...	...	83
History of <i>Papilio Ægeus</i>	...	...	...	91
Notes on Some Australian Lichens	...	...	...	102
The Mantis	...	...	...	105
Review	...	...	...	107
Chitons	...	...	...	113
Preservation of Marine Animals with their Natural Colours	...	...	...	116
Catalogue of the Jacksonian Oological Col- lection	...	...	...	118
Torres Strait	...	...	...	125
Primitive Man	...	...	...	126
Observations on Frogs	...	...	...	129
Bird Notes	...	...	...	131
Parasitic Entomology	...	...	...	132
The Study of Lizards	...	...	...	138
Notes on the Genus <i>Pseudophryne</i>	...	...	...	145
Life and Troubles of an Oyster	...	...	...	149
The Kermadec Islands	...	...	...	153
A Bird Protection Society	...	...	...	155
Natural History Notes on my recent World-Tour	...	...	...	161, 174
The Balance of Nature	...	...	...	167
Foods of Australian Ants	...	...	...	169
Fleas	...	...	...	170
Conversazione	...	...	...	181
The Club	...	...	...	189
"Tagging" or Marking of Birds	...	...	...	191
Index	...	...	...	195

THE
Australian Naturalist.

VOL. I.

JANUARY, 1906.

PART I.

INTRODUCTION.

It is nearly six years since the Naturalists' Club of New South Wales was established. The Club has unquestionably supplied a want. It is now hoped that the publication of a quarterly journal, even though a small one, will still further extend its usefulness. Field work being the main object of the Club, the journal will be found useful as a medium for the record of observations. Since the establishment of the Club two MEMOIRS have been published. These, although of the greatest service to the man of science, seem hardly to meet the requirements of our members. It is owing to this that THE AUSTRALIAN NATURALIST is now issued. The Council hopes that, as time passes and the Club progresses, both by increase of members and funds, that the journal will also advance in usefulness—and grow.

THE ORDINARY MONTHLY MEETING was held in the Board Room, 82 Pitt Street, Thursday evening, November 2nd, 1905, the President, Mr. W. J. Rainbow, F.L.S., in the chair.

ELECTION OF MEMBERS.—Messrs. W. S. Dun and G. F. Longmuir were elected ordinary members, and Miss S. R. Cole, Public School, Medowie, N.S.W., a country member.

PAPER.—Mr. Chas. Hedley, F.L.S., read a short paper on "Pearls and Mother-o'-Pearl," illustrating the same by a series of interesting exhibits.

A number of exhibits by various members brought the business of the evening to a close.

THE ORDINARY MONTHLY MEETING, was held in the Board Room, 82 Pitt Street, Thursday evening, December 7th, 1905, the President, Mr. W. J. Rainbow, F.L.S., in the chair.

DONATION.—Pamphlet on the "Extinct Mammals of Australia," presented by Mr. H. Krefft.

PAPERS.—Mr. J. L. Harrison read a short paper entitled "Notes on Cuckoos," which he illustrated by a series of interesting exhibits; Mr. W. J. Rainbow, F.L.S., also read a paper on "The Quaint Side of Spider Literature," dealing with ancient folk-lore, superstitions and the supposed curative powers of some spiders for certain diseases.

A large number of interesting exhibits was also displayed, after which the meeting adjourned.

FIFTH ANNUAL REPORT.

THE 31st July, 1905, concludes the Fifth Year of the Club, and the Council wishes to report another busy and successful year.

The Fourth Annual Meeting was held on Thursday, the 4th August, 1904, and a large number of members and visitors were present. Mr. Thos. Steel, F.C.S., the retiring President, gave an address on the "Physics of the Sea," wherein he touched on the probable conditions prevailing when the sea was first forming; also on the influence of tides, ocean currents, polar ice caps, and various other interesting phenomena.

The following Council and office bearers were elected:—President, Mr. W. W. Froggatt, F.L.S.; Vice-Presidents, Messrs. H. J. Carter, B.A., and S. J. Johnston, B.A., B.Sc.; Hon. Treasurer, Mr. J. R. Garland, M.A.; Hon. Secretary, Mr. W. B. Gurney; Assistant Hon. Secretary, Mr. L. Harrison. Council: Messrs. F. E. Grant, F.L.S., H. J. Jensen, B.Sc., W. J. Rainbow, F.L.S., F.E.S., Thos. Steel, F.C.S., F.L.S., A. J. Walkom, and G. A. Waterhouse, B.Sc., B.E.

It was with great regret the Council received the resignation of Mr. G. A. Waterhouse from the Secretaryship, and a special vote of thanks was accorded him for his pioneer work as Honorary Secretary since the foundation of the Club.

There were ten ordinary Meetings held in addition to the Annual Meeting, at which a great number of specimens of Natural History were displayed and many interesting notes read.

The following papers were read:—"Fighting and Nest-building Fishes," by Mr. E. R. Waite, F.L.S. "Botanising in Australia," by Mr. F. Turner, F.L.S. "On Beetles and Beetle Collecting," by Mr. H. J. Carter, B.A. "The Evolution of Complexion," by Mr. H. J. Jensen, B.Sc., in which the writer gave an interesting original theory of the causes of racial skin colours of man, pointing to red or black as the probable original colour. "Insect Architecture," by Mr. W. W. Froggatt, F.L.S. "Cannibals and Cannibalism," by Mr. Thos. Steel, F.L.S., F.C.S. "Corals and Sea Anemones," by Mr. C. A. Sussmilch, F.G.S. "The Birds of the County of Cumberland," by Mr. L. Harrison. "The Butterflies of the County of Cumberland," by Mr. G. A. Waterhouse, B.Sc., B.E. "Modern Crustaceans," by Mr. David G. Stead.

Ten Excursions have been held, the localities visited were:—Balmoral (2), Sutherland, Beecroft, Glenbrook (all day), Dredging in the Harbour, Belmore, Watson's Bay, Roseville, and the Australian Museum. The excursions have been well attended by members, and the specimens collected exhibited, with notes on the same, at the various Meetings. To encourage observations and collecting at these trips the Council have arranged that the leaders of excursions and others shall record

in brief the notes made and material collected, and read the former at the Meetings, thus preserving much valuable information.

During the year the Second Memoir of the Club has been published, consisting of "a Synopsis of the Fishes of N.S.W.," by Mr. E. R. Waite, F.L.S. This is a classified list, indicating 526 indigenous species with their popular and scientific names; it also notes the edible fishes and introduced species.

By printing this useful catalogue, and, last year, the catalogue of Butterflies, the Club may congratulate itself upon producing such valuable publications. However, considering the special aim of the Club, viz., the encouragement of amateurs and others, the Council have decided to publish, in lieu of Memoirs, a small journal to contain articles on Natural History, records of observations, etc. It is considered this will prove of more interest and be an encouragement and aid to members, juniors and all, in making observations in the field, and placing on permanent record the results of their work. Furthermore, it will bring country members more in touch with members in Sydney.

The additions to the library have been numerous, and are principally publications sent in exchange for our Memoirs from various scientific societies in Europe and America, as well as Australia.

The Council wish to take this opportunity of thanking Mr. J. R. Garland for his kindness in granting the use of his office for Council Meetings.

On 13th April, this year, the President and Mrs. W. W. Froggatt invited members and friends to a *Conversazione* in St. James' Hall. Several short addresses on Natural History were given, and with the large number of interesting exhibits made a particularly successful gathering. The Council wish to record here their appreciation of the spirit which actuated Mr. and Mrs. Froggatt in bringing members and interested visitors together on that occasion.

It was with deep regret the Club received word of the death of Miss Paul, in February last. She had joined the Club soon after its foundation.

The membership of the Club now stands at 93. Twenty new members were elected during the year, 11 resigned, and 13 names were removed by the Council owing to arrears.

Although a number of names have been already submitted for election in the coming year, the Council would urge members to make the objects of the Club known amongst others likely to be interested, with a view of further augmenting the membership and scope of the Club.

The present satisfactory state of the Club is encouraging, and

the enthusiastic work of members is making its influence widespread.

31st July, 1905.

WALTER W. FROGGATT, President.
WM. B. GURNEY, Hon. Sec.

THE AIMS AND USEFULNESS OF FIELD NATURALISTS' SOCIETIES.

(Presidential Address by Mr. W. W. Froggatt, F.L.S., at the Annual General Meeting, 3rd August, 1905.)

LADIES AND GENTLEMEN,—

I have thought that a presidential address for this evening would be appropriate if it dealt with the aims of Field Naturalists' Clubs in general, and our own in particular.

Nearly twenty-five years ago I was collecting beetles, and gaining colonial experience in the the north-west corner of New South Wales, known then as the Grey Ranges, now as Milparinka, when I heard that a party of ladies and gentlemen had met together in Melbourne and founded a Field Naturalists' Club. On my return to civilization I communicated with several members, and through the courtesy of Mr. Charles French, then in the Botanic Gardens (and as ardent beetle collector then as now), I began to name up my collections. After that my interest in Natural History never flagged. I had always been a bush naturalist, but the assistance gained from the F.N.S. of Victoria set me on a definite track, and I therefore consider that I owe a great deal to our first Field Naturalists' Club. I have since been identified with, and taken a keen interest in the first two Societies that were formed in Sydney on these lines, and after their death, when it was proposed in 1900 to start our present flourishing Society, readily joined in the movement. Nearly every naturalist has commenced his life work as a collector, but the simple accumulation of specimens, be they beetles, birds' eggs, minerals, fossils, or plants, does not make a naturalist. If he stops at this he never reaches beyond the stage of a collector—he might as well collect match-box lids or cigarette cards.

Darwin tells us that as a boy he collected all kinds of specimens—beetles, plants, stamps, seals, and many other things—and might have never done any scientific work if it had not been his meeting with Prof. Henslowe at Oxford, through whose kind offices he had the offer of a position on the exploring ship *Beagle*, the story of which he afterwards told in "The Voyage of a Naturalist," which should be read by every one of our youthful members.

Now, the primary object of a Field Naturalists' Club is the bringing together of all the young people, reaching out its hands to the young students and collectors, bringing them within its

influence, and showing them the true significance of Natural History, the why and the wherefore, or as Kingsley puts it—"Madame How and Lady Why."

One person may take a walk in the bush and see nothing. It was simply a walk, and with or without a companion it was a bore, making one wish one had stopped inside and had a smoke; but let him once harken to Dame Nature's voice, and the bush land or garden is a different world, with wonders on every hand. And as he advances, diving deeper into the secrets of that world, only revealed to those who love Nature, he finds every little creature and plant has some valid reason for its existence, some corner to fill in the harmony of creation. Nothing has come by blind chance, the colours and shape of each flower have been slowly evolved and adapted either to attract insects that fertilize their seeds or protect them from their enemies. The large ground hunting beetle is clothed with stout armour plate, as he is too heavy and ponderous for flight, to escape his many perils; while the fragile butterfly, in gay spangles of green and gold, is all wings, ready to twist and turn in flight. The long hind legs of our plain kangaroos enable them to spring over obstacles that other animals would have to go round, whilst the marsupial pouch and long legs combined enables the animal to spring over burning grass in the case of bush fires, and carry her baby with her. The thick papery bark of many of our native trees are also useful in protecting them against fire, for in bygone days all Australia in summer time was a land of bush fires.

There are many side issues that we can bring before our young or lay members, such as this—*mimicry*—the adaption of certain creatures to their surroundings either as a means of protection, or as a cloak to hide their presence from the creatures they catch. *The distribution of species* both in Australia and beyond for the fauna and flora of our island continent are unique, as we find living specimens of plants and animals only found in the fossil beds of the old world. The few exceptions found on the Malay Archipelago, Africa, and the west coast of America only emphasise these facts. The discovery of new species, in all branches, is in the power of every member, as thousands of creatures are waiting for description and definite scientific names, so that they can be universally recognised by scientists.

There is a rich and almost virgin field in every line we can take up; there is room for hundreds of field naturalists without the least fear of them overlapping each other's work—very different from the old world, where every new species is recorded as quite an event. Yet, how little the average Sydney native knows about the natural history or geographical features of his native land! Even the better class of bushman "out back" will tell you that the death adder stings with the tail,

the poor little gecko lizard is a "wood adder" abounding in venom, and should be killed at sight, that lots of people have been killed by the bite of red-tailed spiders, and other queer ideas that are just as incorrect.

Field naturalists are in the first place Nature students, and now that the educational authorities are moving in the matter and teaching Nature study in the schools, we may hope for a better state of knowledge of common things among both our old and young folk, for as Professor Huxley says, "Science is only common sense applied to common things." We may hope that under trained teachers the powers of observations will be so enlarged that the school children will take an intelligent interest in the many wonderful and beautiful things they come in daily contact with, and a bird will not be simply a thing to throw a stone at, or every spider a "triantilope."

Here, again, our Society may do good work by bringing both metropolitan and country schoolmasters into our ranks. If we can only get them to understand that they can avail themselves of the services of a number of workers—specialists in the different branches of science who can tell them something of interest about the specimens they collect, name their sendings, and thus supply them with a fund of valuable information that they can in turn impart to the small folks under their charge, I think we do not exist in vain. When we have interested the teachers our work will travel over every inland town and township, to the far away schoolhouse, by creek and lonely homestead; and our work does not stop here, for the seed sown now will blossom out again on to the next generation.

This is the true system of Nature study: learn one little fact about any common thing, and we invest it with a new interest, we open up new fields to thousands of bush children, and fill what might otherwise be dull hours with brightness.

We shall in turn obtain many interesting, and often original, or new facts from the schoolmasters, for they have great opportunities in districts beyond our reach of obtaining specimens and working out the life histories of creatures we only know from dead forms.

Recording the range of the fauna and flora of each district before the more delicate forms have succumbed to the advance of civilization, is another matter we should take up; the rediscovery and record of the exact locality of specimens that were originally described with the vague locality, Australia or New Holland, would be useful work indeed.

Taking the smaller creatures, such as insects, while there are hundreds described every year, the bulk of them are simply bald descriptions of the form, shape and colour of dead specimens often from single examples. From a systematic point of view these may be excellent, but the general reader wants more, and to him a single life history of an insect, tracing out

its development and food plant, is of more practical value than a hundred technical descriptions unaccompanied by any other information.

The advances that have been made in economic zoology during the last twenty years have done a great deal to popularise this branch of science, and to show its commercial value. The study of the relations of insects and disease is only just in its infancy. It has been proved that the bites of mosquitos in malaria-stricken country are the means of spreading tropical fevers; and that in the same way fleas that infest plague-stricken rats may, when they bite human beings, infect them with plague.

The red water disease of cattle, that swept over Queensland about ten years ago, and still exists in many districts, was carried from infected animals to healthy ones by cattle ticks, and it was not until it was found out that while the innocuous ticks that were not virulent with redwater bacilli caused tick worry, through the immense numbers that infested the cattle, it was the bacilli-germ infested ticks that caused the more serious redwater; and when the first was treated by dipping, and the last by inoculation, they were kept in hand. The spread of disease by insects that feed upon filth or decaying matter—particularly the Diptera or two-winged flies—is a well established fact, and the old idea that flies were useful, as they were scavengers and ate up decaying matter, is quite at a discount. The prompt burning, burying, or liming of all such matter has lessened diseases in a wonderful manner. Flies are known to spread disease germs in two ways—first, by flying into and contaminating our food, by which means germs of typhoid, cholera, etc., are introduced; or inducing blood poisoning by settling on open sores or cuts. Many deaths in the country have been thus caused by an insignificant fly.

The fauna and flora in the immediate neighbourhood of the city are being rapidly exterminated. Every year we find houses and gardens taking the places of native scrub. Many fine insects in the Macleay Museum collections were taken by Mr. Masters about Elizabeth Bay, Petersham, and other places quite close to the city; these have now vanished from those parts. Even ten or twelve years ago, all round Rose Bay, Mosman, and North Shore one could find large patches of flowering *Angophora*, *Leptospermum*, and other shrubs, which have been cleared off to make room for houses, thus every year forcing collectors further afield. With the destruction of plant and insect life small mammals and birds die out, or move back before civilization.

I have found that the advent of large numbers of honey bees into a district will soon spoil it as a summer collecting ground, because when domestic bees swarm over flowers our indigenous insects leave in disgust. Introduced weeds and

plants have changed whole districts, and are in many instances more destructive and far reaching pests than animals. Thousands of acres of valuable land have been rendered practically useless through the spread of prickly pear; lantana scrubs occupy many acres on the northern rivers; sweet briar covers acres of our southern districts, and blackberry brambles much more; though in the Bulli district the blackberries are quite a source of revenue to the miners' wives and families.

On the plains hardy cosmopolitan vagabonds like thistles, cockspurs, docks, etc., shoulder out and choke our more delicate native plants.

Native animals in the same way are vanishing in many districts, and the large kangaroo and emus were doomed on the plains when wire fences came into vogue. The ring-barking of great tracts of country is death to the native bear. I was told by an orchadist beyond Rylstone that as the area of dead trees spread around the native bears made their way into his orchard, where he had in a very short time shot over three hundred. Bad times during the drought sent a lot of men out trapping, and opossums were very nearly exterminated in many districts; and when some ingenious person found that a bit of cyanide of potassium rolled up in a morsel of pollard was a bait that no hungry opossum could resist, and killed the unfortunate opossum on the spot, the poor beasts had a bad time indeed.

In Southern Gippsland foxes have become so numerous that all ground nesting birds are in a fair way to extinction. The lyre bird builds its nests usually only a foot or two above the ground, and it is to be hoped that before the last of them fall victims to Mr. Reynard, they will learn to build out of reach.

In bringing this address to a close, I would point out that members of this Society are a band of workers and learners, kindred spirits forming a small democracy, the only qualification for which is a love of Nature. As field naturalists, we differ from the more pretentious societies, in the fact that we gather in the apprentices of the craft, many of whom later on will come into the higher societies, like the Linnean and Royal.

Our little Society is now fairly established, and though our membership is small, it consists of sound members; and I see no reason, if we each work for the good of the Club, that our number should not increase into hundreds when its objects are better known and understood, for nature study is deep down in the hearts of all thinking people, and only wants bringing out. At the best we are but as "little children gathering up shells on the sea-shore." But if only one of our shells is an original observation, we have added that mite to the Natural History of the world.

NOTES ON CUCKOOS.

(By Mr. L. Harrison. Read at the Monthly Meeting, December 7th, 1905)

THE cuckoo family is spread throughout the whole world, and embraces a number of genera which are widely different in habits and appearance, but nearly all of which have one peculiarity in common. With the exception of the American cuckoos, the so-called swamp pheasants, and one or two other isolated species, every member of the group is a parasite, and devolves the task of rearing its young upon some smaller bird. The exceptions do build primitive nests of their own. It is on the subject of this parasitic habit that I am going to speak; but a short preamble about the cuckoos of Australia may prove interesting.

First of all—and I suppose the question has already arisen in your minds—not one of our cuckoos utters a call sounding anything like the word “cuckoo,” the Spring call of the European species, except perhaps its congener, *Cuculus intermedius*, from North Australia, of whose habits and economy little appears to be known. Still there are points of similarity. Wordsworth says of the European bird: “Cuckoo shall I call thee bird, or but a wandering voice?” There is a great deal of the wandering voice about some of our species, and they are far more often heard than seen. I have stood under a fine large eucalypt for nearly half an hour, whilst a cuckoo shrieked himself hoarse amongst the branches without being able to see him. It is not that the voice is really ventriloquistic, as is the case with a number of birds, but it rings through the air in a disembodied fashion which renders it difficult to trace to its source. So, too, with the fan-tailed cuckoo, a bird common in the sandstone gullies about Sydney; but, although its rolling note may come to the ear from all sides, the bird is rarely seen unless you look for it carefully.

The European cuckoo has, traditionally at any rate, a cheerful note; but our species, with the exception of the pallid and brush cuckoos, seem to be oppressed with all the ills that flesh is heir to, and one or two more besides.

Australian cuckoos range in size from the Channel-bill of the North Coast, a bird which the older writers classed as a horn-bill or a toucan, and which is certainly very little like a cuckoo, and the swamp pheasant, down to the little bronze cuckoos, the intervening species comprising one koel, two *Cuculus*, two *Cacomantis*, and a *Misocalius*. Of these we get five species in the neighbourhood of Sydney—the pallid, fan-tailed, brush, bronze, and narrow-billed bronze cuckoos. The Sydney species, with the exception perhaps of the two little

bronze cuckoos, are very distinct with regard to appearance, song, and colouration of their eggs. The largest—the pallid cuckoo—which is often dubbed the stormcock or mosquito hawk, has a rollicking call running up the scale, and lays an egg of a light buff colour, sometimes slightly spotted. The fan-tailed cuckoo has a monotonous rolling whistle, is easily distinguished by its rufous breast, and lays a pinkish-white egg, spotted with brown. The brush cuckoo has a peculiar song—all its own—which it is easier to imitate than describe. Its egg is white with a zone of brownish red spots. The bronze cuckoos can only be distinguished at close range, the narrow-billed species having a line of grey round the margin of each feather on the back, whilst the bronze cuckoo has one continuous spread of metallic green. The note of the smaller bird is the same wailing whistle, but he is more talkative, and repeats his note in a subdued tone—a fact useful to collectors in the field. The female of the larger bird is touched with the metallic colour; but Mrs. Narrow-bill has no trace of lustre. Their eggs, however, are very distinct, one being olive in color, the other white, spotted all over with red.

To turn to the parasitic habit, there is only one weak hypothesis available for its origin; but students of evolution will know what slight variations have become perpetuated to the advantage of certain species, and will perhaps be able to follow this frail argument. It is a well-known fact that certain birds, either from stupidity or carelessness, occasionally lay their eggs in other birds' nests. It is surmised then that the beginning of the cuckoo habit rose from some such accident. A primitive cuckoo was too tired to go home, or too indolent to sit on her egg, so she just dropped it in someone else's nest, glad to be rid of it. To her astonishment, the other bird hatched her egg for her; leastways, she would have been astonished if she could have reasoned it out. Anyhow, the instinct to foist off the egg on some other species gradually increased in force, until finally all the cuckoos adopted the *crèche* system, and left their prospective and material infants out while they went about their business.

That is all we can say about the acquisition of the habit. With regard to the method of placing the egg, a controversy has raged over a large number of years, some people asserting that the cuckoo lays in the foster nest in the ordinary way, and Mr. North, our own ornithologist, still believes this, as far as I can judge from his remarks in the catalogue at present being issued from the Australian Museum; others that the bird lays its egg on the ground, and carries it in its mouth to the foster nest. The latter view is now generally accepted; yet, in spite of the number of observers in the field, and though one or two persons claim to have seen the operation performed, no reliable

evidence on the point is forthcoming. The main point in the argument is the impossibility of cuckoos entering some of the dome-shaped nests in which their eggs are found. A European cuckoo, however, has been shot while carrying an egg in her bill. The only Australian evidence I know of is the egg which I exhibited at the November meeting of the Linnean Society, and which was taken on the ground at Dee Why, near Manly, at a spot from which a pallid cuckoo was flushed. If my brother, who took the egg, had been a little less excited at his discovery, and had watched to see the outcome of the proceedings, the question might have been settled once and for all. However, it is good presumptive evidence that the pallid cuckoo deposits the egg with its bill, which is especially interesting, as this cuckoo always chooses an open nest, and it seems that it is not necessity which drives it to carry the egg in its bill, but a deliberate preference. This bears out the researches of a German gentleman, who has spent some twenty years in the study of the European cuckoo, and who states that the species uses both methods of depositing its egg, but prefers the latter. I have only seen a *résumé* of the paper, and so cannot tell whether he has actual evidence for all his statements.

The cuckoo finds the nests by watching the birds building, and I have on more than one occasion been led to a nest by the actions of a cuckoo. Cuckoos frequently make mistakes, however, as their eggs are often found in unfinished nests, which are then promptly deserted by the owners, though the tomtit sometimes goes on building, leaving the intruder's egg embedded underneath the lining.

[Mr. Harrison concluded by remarking that much more could be said upon the subject, but he would content himself by going through his exhibits in detail, making each the text of such observations as occurred to him.]

"PEARLS AND MOTHER-O-PEARL."

(Abstract of Paper read at the Ordinary Meeting on Thursday, Nov. 2nd by Mr. C. Hedley, F.L.S.)

BOTH from an æsthetic and a commercial aspect pearls may interest Australians; from the former standpoint the beauty of the pearl, perfect when least adorned, has been admired by all people in all ages; from the latter the most prolific beds of the world are those of Torres Straits and West Australia.

Many bivalves produce pearls. The finest gems are contained by various species of the genus *Meleagrina*. First the giant *M. maxima* which is principally gathered in Australian seas; secondly the *M. margaritifera* from which the Tahitian and other South Sea Islands are supplied. Thirdly the *M. vulgaris*, the source of the Ceylon pearls. The fresh water mussels yield but a scanty harvest.

The formation of pearls is a secret which has baffled many inquirers, and is not yet completely solved. The poets claimed that a drop of dew was caught within the valves and grew into a pearl. Most modern writers supposed that a grain of sand or other irritant was coated with pearl and so formed the nucleus on which the gem was built. Recent discoveries indicate that the mummified larva of a tape worm is the usual commencement of the pearl.

Torres Straits is the richest field in the world. A hundred thousand pounds worth of pearl shell is sometimes exported thence in a year. About half a century ago the pearl shells were discovered on the reefs by wandering *beche-de-mer* fishermen. At first they picked up the shell exposed at low tide; then native swimmers were engaged to collect from the shallow water beds. Ultimately the beds in deeper water were exploited by the introduction of diving apparatus.

The pearl shells are propagated by eggs which float on the surface of the sea, and thus may be transported by currents to a distance. After about a week the young fry develop a shell and sink to the bottom. Here they crawl rapidly about and select a suitable spot where the water is clear and they are not in danger of being choked with mud. Finding a suitable resting place it ties itself to a bit of stone, weed, or another oyster by a bunch of threads.

Its food consists of minute vegetable or animal atoms floating in the sea. A stream of water is perpetually sucked in and pumped out, and whatever eatable is carried through in this current is sieved out and absorbed. The pearl oyster probably reaches its full size in four or five years.

OBITUARY.

It is with deep regret that we have to announce in this, the first issue of our journal, the death of a member, Mr. J. F. Morris, B.E., F.G.S., which occurred in the Malay States on December 23, 1905, at the early age of 27. Mr. Morris was a member of Dr. Jack's expedition to the Yangtse Valley about the time of the Boxer troubles, and passed through some exciting experiences. Our members will remember that on his return to Sydney he delivered a lecture before the Club—a lecture which, from its interesting nature, will long be borne in mind by those who heard it. The deceased was a young man of much ability, and it is to be deplored that what promised to be a brilliant career should have come to such an untimely end. The news announcing Mr. Morris' demise was very brief, having been received by cable. To his mother, Mrs. Morris, and his immediate friends, we tender, on behalf of the Club, our heartfelt condolences.

THE
Australian Naturalist.

VOL. 1.

APRIL, 1906.

PART 2.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE ORDINARY MONTHLY MEETING was held in the Board-Room, 82 Pitt Street, on Thursday Evening, 1st February, 1906, the President, Mr. W. J. Rainbow, F.L.S., in the chair

ELECTION TO MEMBERSHIP.—Mr. D. Cahill, Yarrangobilly, N.S.W.; Mr. Henry Dawson, Solicitor, Elizabeth Street.

PAPER.—Mr. H. I. Jensen, B.Sc., read a paper entitled, "Geographical Changes in Geological Time," which was illustrated with diagrams and lantern slides.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street, on Thursday Evening, March 1st, 1906. The President, Mr. W. J. Rainbow, F.L.S., occupied the chair, and expressed on behalf of the Club their congratulations to Mr. E. R. Waite, F.L.S., who was present, on his appointment to the Curatorship of the Canterbury Museum, Christchurch, and the Club's regret at losing him as a Member.

ELECTIONS TO MEMBERSHIP.—Messrs. W. T. Seaward, Gundy, N.S.W.; J. S. Stewart, Gundy, N.S.W.; F. E. Stewart, Dilga, N.S.W.; H. Krefft, Paddington, Sydney, and R. L. Harrison, Manly, Sydney.

BUSINESS.—The business of the evening was devoted to practical demonstrations: Mr. Edgar R. Waite, F.L.S., demonstrated "How to Handle Snakes." He exhibited various implements designed for the purpose, and showed, by means of living subjects, how such were used. He also demonstrated the methods of extracting snake venom for purposes of scientific research, and mentioned the names of Mr. James S. Bray and Mr. McGarvie Smith as the principal workers in this connection, and to the latter gentleman Mr. Waite wished to express his thanks for much information afforded at various times, and also for the loan of appliances which had served as models for the instruments used at the meeting. The snakes used in the demonstration were kindly lent to Mr. Waite by the firm of Tost & Rohu, Martin Place. Several ladies no doubt now feel proud to be able to state that they have held a snake, although some of them had previously expressed the intention of not even entering the room where the reptiles were known to be.

Mr. S. J. Johnston, B.Sc. showed the apparatus necessary, and explained how a beginner should set about collecting botanical specimens. Similarly, Mr. D. G. Stead explained the mounting and preservation of crustaceans, and Mr. L. Harrison the method of stuffing a bird.

GEOGRAPHICAL CHANGES IN GEOLOGICAL TIME.

By H. I. Jensen, B.Sc.

To whatsoever branch of natural history we devote our attention, we see cycle on cycle set. Repetition of similar events at intervals occurs as truly in natural history as in human history; as examples of such repetitions one might quote sun-spot periodicity, weather cycles or magnetic cycles, as well as the whole progress of organic life and evolution. Nature, indeed, is a vast recurring decimal. The ancient Brahmins described the evolutions of the earth from a mass of atoms to an organic whole, and believed that it would be resolved again into atoms at the end of a "Kalpa" to commence the process afresh. This alternate creation and destruction tended in their minds to hinder stagnation and to beautify by effect of contrast.

Eternal change is also a characteristic of the features of which we geologists make a study. The earth is continually being altered in aspect, and places once dry land are now deeply submerged, while other areas have been reclaimed from the sea by geological processes. One region in which such changes have been effected in the historic period is the north-west of Europe. We know how the sea has captured part of Holland and how it is continually encroaching on southern Scandinavia and Denmark. Many flourishing farms of 600 years ago are now beneath the Baltic wave. As Höedt writes:—

Where the sea is smiling
So peacefully,
There stood a city
In days gone by;
But the green earth opened
To make a grave,
And the city slumbers beneath the wave!

or Klaus Groth—

Under the sea lies Büsum old,
O'er it the waters wild have rolled!

While Denmark and Skaane are thus subsiding Sweden, north of Skaane, and Norway are undergoing elevation, nevertheless the fiords of Norway, which are considered to be drowned valleys, show that this part has lately emerged from an age of subsidence.

We may for the purpose of this study classify earth movements into (a) Great movements of continent making and mountain building depending on folding, (b) Sudden and less important movements of subsidence effected by means of faulting probably induced by volcanic extravasation, (c) Small crustal movements along the coasts depending on changes in load brought about by the denudation of the land and the accumulation of sediments in the sea.

Evidence that such changes have taken place may be found in a great many ways. The existence of sedimentary strata with marine fossils in our highest mountain chains, the occurrence of anticlines and synclines in sedimentary rocks, the occurrence of plains of marine erosion and of "pene-plains" elevated thousands of feet above the sea are indications of great mountain building and continent forming ("epeirogenetic") movements. Sudden movements leave their traces in faults of a throw amounting to hundreds or thousands of feet. Sea basins like the *Ægean* and *Adriatic*, as well as the *Mozambique Channel* and the *Rift Valley* are instances of subsidence areas ("senkungsfelder"). Great movements of both kinds may be traced to a common cause, namely secular contraction of the earth through cooling.

Coastal movements depending on changes in load (isostatic movements) leave their evidence in raised beaches, submerged forests, coal and carbonaceous shale beds, intercalated between marine shallow-water strata (*e.g.*, sandstones and shales) and so on. The great *Pampas* of the *Argentine* owe their existence to an isostatic upward movement consequent upon a change in the direction of drainage in *South America*. The *Queensland coast* abounds in raised beaches formed by such movements. Closer to home we have the drowned valleys of *Port Jackson* and *Botany Bay*, evidencing *Tertiary* subsidence, whilst still more recent elevation is witnessed by the *D.Y. Lagoons* at *Narrabeen*, and the "*Tombolas*" of *North and South Heads*.

Suess shows that the *Biblical Deluge* was an inundation of the lowlying *Mesopotamian plain* brought about by an earthquake in the *Persian Gulf* which hurled the waters upon the land, and that probably a cyclone from the south-east aided in damming up the water. Similar events have taken place in more recent times as, for example, the great earthquake of the *Indus Valley* in 1819, which formed the *Runn of Cutch* and like catastrophes in the *Ganges-Brahmapootra Valley*. Events of this kind are, however, very insignificant from a geological standpoint.

The movements of subsidence which permitted the growth of the *Great Barrier Reef*, and of elevation which have left *Tertiary* sediments high and dry in *Queensland* are of a different order, and leave ineffaceable records in geological history.

It is now generally supposed that a large land mass existed in *Mesozoic* times in the *Pacific*, the *Wallace-Hedley Continent*, which our friend *Mr. Hedley* has done so much to elucidate. *Mr. Douglas Mawson's* geological work in the *New Hebrides* in addition to giving confirmation to *Mr. Hedley's* work, shows us the vastness of the movements in progress there. The labours of *Dr. Woolnough* in *Fiji* and of *Professor David* and

Mr. E. C. Andrews in Funafuti and Fiji, are of great value in impressing us with the continental origin of many of the Pacific Islands as well as the vastness of geological processes. By subsidence this continent of the Pacific has resolved itself into a group of islands.

On botanical, zoological and palæontologic grounds we have reason to believe that Australia was once joined to Africa (via Haeckel's Continent of Lemuria). Less disputable is the idea of a former, Tertiary, land connection between North Australia and Southern Asia and the Philippines. Of late years scientists have also found good reasons to believe that our continent has at one period been connected with South America across the South Pole by the continental mass we now call by Capt. Hutton's name of "Ancient Antarctica."

Of still greater interest are Professor Hull's bathymetrical researches, which show a great extension of the "British Platform" into the Atlantic Ocean in the Miocene period. Professor Hull shows that an elevation of 1,300 feet would almost connect Europe with Iceland. The Icelandic flora proves an old land connection (Wallace). The submerged river, valleys and canyons which dissect the platform empty into the Atlantic at a depth of 9,000 feet. The platform extended south as far as Portugal, and is cut by the submerged canyons of the Shannon, Erne, La Manche, Loire Adour, Gironde, Lima, Ebro and Douro. Hull quotes these facts as evidence of an elevation of Western Europe by 9,000 feet in glacial times, and a resubsidece of equal magnitude. Professor Brögger by a study of the distribution of the littoral fauna arrives at the same conclusion. Recent strides by Scandinavian geologists and investigation of the kitchen-middens show that the Sound and the Belts were formed by an irruption of the sea while Neolithic man lived in Scandinavia, and that in recent times the Baltic has become gradually fresher through a submarine elevatory movement south of the Gulf of Bothnia.

Professor Hull's researches are interesting as bringing further confirmatory evidence of the existence of Atlantis, the now submerged continent round which many myths have been spun. An elevation of much less than that which Hull has demonstrated would render the Challenger and Dolphin Ridges *terra firma*, and connect the Azores with Spain. Plato's Poseidonis becomes no idle dream, and geology is at last in a position to support here, too, the evidence of Botany, Archæology, Ethnology, Tradition, and Poesy. It is surely not by mere chance that pyramids were fashioned in Central America as well as in Egypt; that the Phœnician, Egyptian and Mayan alphabets have many letters in common; that names like Atlante, Colima, etc., existed on both sides of the Atlantic before the time of Columbus, that "round towers," elephant mounds and serpents

mounds existed on both sides; that the old Irish pipes were similar to the Indian pipes; and that the religions of the Old and New Worlds embodied the same quaint myths.

The hypothesis of Atlantis is further supported by the existence of fossil dwarf elephants in the West Indies and by the fossil ancestors of the horse being found in America, while the animal was unknown there at the time of Columbus. For no vain reason was Pluto the god of the Atlantic and of Atlantis depicted on a pair of horses.

My object has been in this short sketch to point out how changeable all is, even the the steadfast mountains, and to emphasise that in our search for truth we must not treat with disregard other sciences, as many do. Much valuable information can be obtained from such hazy sources as tradition and mythology. To solve great problems we must look at all sides of a question, and not merely at one aspect such as the geological. and we must strive for

The gift that sees with glance profound
The Secret Soul of Things,
And as it lingers hears the sound
Of vast and viewless wings.

A BEETLE HUNT ON MT. KOSCIUSKO.

(By H. J. Carter, B.A., F.E.S.)

IN January of this year it was my good fortune to ascend Mt. Kosciusko in the excellent company of Professor David and his son, Judge Docker, and my two sons. A bicycle ride of 35 miles from Cooma brought myself and sons to Jindabyne on the Snowy River. Here we were joined by the remainder of the party, and camped in a roomy tent on the left bank of that beautiful stream for the next week. Between Cooma and Jindabyne there was little time and opportunity for much collecting. The country consists of undulating plains, at times (especially between Berridale and Jindabyne) thickly covered with Eucalypts, but for the most part intensely dry. By energetic log-rolling a few Carabidæ (*Helluo* and *Promecoderus*) were picked up, while *Anoplognathus pectoralis*, Burm., and *A. pallidicollis*, Blanch., were shaken from the gum trees. *Helæus tuberculatus*, Brême, was fairly common. Around our camp on the Snowy River there were a few Eucalypts in flower from which several species of *Stigmodera* were captured. Amongst the latter was a pretty little species I have previously taken in the Blue Mts., and is as yet unidentified. A few late flowering bushes of *Leptospermum* yielded *S. crenata*, Don., and a species of *Cisseis*, while forms included in the families Anthicidæ, Mordellidæ and Malacodermidæ were plentiful. *Bæchia virgate* bushes were literally swarming with

Diphucephala pulchella, Bl., and *Belus suturalis*, Bois. Under logs around Jindabyne many interesting Heteromera were captured. On the very edge of the Snowy River amongst the shingles and refuse some interesting Carabidæ came to light. These included the graceful *Eudalia macleayi*, Bates, and another of the same genus, but which differs from the species named in having black legs and a stouter build.

Through inability to get pack-horses for our mountain trip, we were compelled to wait a whole week in our Jindabyne camp—not without interest of many kinds. Perhaps the most productive collecting was done on the road leading at right angles to the Snowy River towards the Little Threadbo route, via Mr. Smart's homestead. About two miles from Jindabyne the road ascends steeply amongst some fine Eucalypts. The loose bark on these trees was extraordinarily prolific in Coleoptera—Tenebrionidæ, Cleridæ, Cistelidæ and small Carabidæ being especially abundant. Further on the road passes through paddocks in which a few specimens of *Carenum lævigatum*, Macl., were found, and along the moister ground near the creek (near Mr. McEvoy's farm) some interesting forms occurred, *Sarticus monarcensis*, Sl., and *Promecoderus inornatus*, Macl., being in considerable numbers.

Bush-whacking produced some interesting weevils, which included, among others, *Gerynassa affinis*, Bl., *Cyrtalia sydneyensis*, Bl., and *C. erichsoni*, Pasc. Some interesting Amycterids were picked up from under the many logs that bestrewed the paddocks. These last included *Sclerorrhinus tristis*? Germ., and *Psolidura elongata*, Macl., besides many specimens of a small *Cubicorrhynchus*. Our tent at night proved fatally attractive to several smaller beetles, *Dasytes fuscipennis*, Hope, and *Apate excavata*? Lea, being regular visitors, while single specimens of *Titæna* sp., and *Phacodes personatus*, Er., were thus captured.

After a week of Jindabyne we were not sorry to make the promised start for Kosciusko. The journey occupied the best part of a long day—that is if you have nothing better to ride than a worn out hat-peg of a "Rosinante" provided by the local guides (mine actually came to a standstill from sheer exhaustion some miles before reaching Betts' Camp, and I had to take the packhorse as an agreeable change). This will explain why collecting was only possible for the half-hour spent at Sawpit Creek, about 4,000ft. altitude. Here, however, is a fine district for Carabidæ and Heteromera. Amongst the former we took *Notonomus muelleri*, Sl., and *N. atripennis*, Sl., and of the latter *Adelium monticola*, Bl., and *Coripera geminata*, Lea.

A collector to do Kosciusko properly should camp at least at three different elevations, and certainly Sawpit Creek should be one of these. It was with great regret both in ascending and descending so much delay was caused by the guide's late start, that I could spend but little time in this prolific part of

the mountain. It is true that a few hurried snatches were made both before and after Sawpit Creek at likely spots. For example, near Mr. Spencer's farm *Anoplognathus hirsutus*, Burm., and *A. montanus*, Macl., were thus taken (they were present on the Eucalypts in great numbers); but the only systematic collecting was done at and around Betts' Camp (about 6,000ft.) and at Pretty Point (5,700); and only five nights in all were spent on the mountain, so that the insects taken are only a fraction of the number and variety that could be taken by an active collector who could afford to spend at least a month—preferably January—in this magnificent district. Our headquarters on the mountain was Betts' Camp, a two-roomed hut built by the Government for the accommodation of tourists. There is little or no furniture therein; a few gum twigs takes off the hardness of the floor, and on this you spread your blankets and get what sleep you can.

We managed to strike a peculiarly hot period of this climatically variable region. On a former occasion I have gladly crept into the sleeping bag made of sheep skin—wool inside—with all the clothing available. This time I lay OUTSIDE the blankets clad in simple pyjamas, and was tormented by mosquitoes. Query: Are these mosquitoes a late importation? I have twice before visited the mountain, five and seven years ago respectively, but have not met with this pest before. The blow-flies by day are also a great pest in this hut, probably encouraged by the dirty habits of its varied occupants in leaving half-emptied tins around.

We were much delighted at Jindabyne to watch the proceedings of a blue ground wasp, who busily employed her day by capturing blow-flies for the purpose of giving them a decent burial. Seven times did she return to one hole in the sand, each time bearing her trussed victim below, sometimes partially closing the hole of the interment by scratching the sandy soil backwards, much like a dog does, with a sort of kick backwards of the hind legs. This wasp deserves encouragement at the hands of the Government: some small subsidy as scalp-money per head of blow-fly, just to show that it is appreciated as a pest destroyer.

From Betts' Camp excursions were made to places of interest, and beetles were found to the very summit. Two fine Amycterids are common on the very edge of the snow-drifts: *Psolidura* sp., a fine black fellow (remarkable for his smooth pronotum) and a *Sclerorrhinus* (possibly *longus*, Macl.), while around the very pools of water *Scopodes simplex*, Blackb., is common under stones. On the shore of the Blue Lake I found a lovely little *Perperus*—as blue as the lake itself, while other smaller Carabidæ occurred.

As far as the tree-line extends *Paropsis* and *Heteronyx* are common, while two Scarabæids were much in evidence—a

Xylonychus and *Eurychelus marmoratus*, Blanch.—the latter a darker colour than the Blue Mountain variety. The *Xylonychus* were buzzing around every night in great quantities, and could be shaken off almost any *Eucalyptus coriacea* in the district. It is probably an undescribed species, though resembling the Tasmanian *X. piliger*, Blanch., in its hairiness, but very much larger. It is probably the species that Mr. Helms mistook for *X. eucalypti* in his list of the Kosciusko fauna, since that species was nowhere encountered. This hairiness is a very common feature of Kosciusko coleoptera, and certainly a warm clothing is very suitable to the snowy surroundings. Some of the most hirsute forms I possess are amongst the Kosciusko captures, many of them belonging to genera not usually pilose. For example a new species of *Dædrosis* is thus furnished, while some of the *Liparetrus*, and other allied forms were remarkable for the excess of this vestiture.

One of the most interesting captures (we took six specimens either at Betts' Camp or Pretty Point) was *Lepispilus stygianus*, Pasc. Some doubt has been cast on the distinctness of this species from *L. sulcicollis*, Bois.—a doubt somewhat emphasised by Mr. Champion (Trans. Ent. Soc. Lon., 1894, p. 393) who examined the type (apparently a single old specimen) in the British Museum, and thought it possibly a worn-down form of that common N.S. Wales species *sulcicollis*. My own specimens were quite fresh, and in each case were quite black, shining, and in shape and sculpture quite different to the mottled grey, opaque form described by Boisdual (specimens of which—very fine ones too—were also captured in this district).

Another interesting beetle is the beautiful *Diphucephala elegans*, Blackb.—perhaps the finest of that fine genus in Australia. I have seldom seen any plant so covered with beetles as the *Pultenæa (fasciculatus?)* was with this lovely iridescent green and gold insect. A small *Diphucephalid* with a coppery abdomen found near Pretty Point, is probably new.

My last two nights on the mountain were especially reserved for Pretty Point, where a small tent had been planted on the ride upwards for myself and son. We collected busily on two occasions—the ten-mile walk between Betts' Camp and Pretty Point. It is worthy of note that the larger Carabidæ are scarce beyond about half-way between these points, while the larger growth of trees proclaim the belt in which some fine Carabs are fairly plentiful. Several species of *Notonomus*, including one that is probably new, were amongst our booty here. Some curious Cryptorhynchid weevils are common at this point, under logs, and so closely do they resemble the rotten wood that they are at first difficult to see. An *Athemistus* sp. was also similarly picked up in some quantity, together with a *Ceratognathus* of two kinds which I have not yet identified.

At Pretty Point we were rewarded by the sight of a few *Eucalyptus coriacea* in flower, but this also was followed by a great disappointment: That evening one of those sudden changes, so characteristic of Kossy, occurred—a cold spell with dense fog and mist. During the only two bright sunny hours we spent here, some rare beetles were collected, including a new species of *Stigmodera*, a fine Longicorn (also probably new), *Macrones exilis*, Newm., and several nice Chrysomelidæ.

The next two days we could only grope about in the fog, beat a few bushes and collect ground beetles by keeping strictly to the track. A fine *Heteromeron* was found here in some numbers, *Apasis puncticeps*, Lea, which is much larger than its only congener known to me (*A. howitti*). The latter I have taken on Mt. Macedon, Victoria. These insects have the faculty—somewhat rare amongst the Tenebrionidæ—of stridulating loudly, doubtless as a protest against the cyanide treatment. I have noticed a similar thing in *Adelium geniale*, Pasc., alone of this and allied genera. A handsome *Chrosis* was also safely bottled at this point.

Pretty Point is perhaps the best collecting centre for a naturalist on the mountain. Here the range suddenly and steeply ascends, presenting a steep escarpment to the Threadbo Valley, and this is the happy hunting ground for the fauna of the lower world as well as of the Alpine forms, the vegetable life showing a similar connection. Nowhere in the route is the flora more varied and picturesque than here, and on the slopes leading to the Threadbo—a fact noted by that sworn friend of Kossy, Mr. Maiden, in his interesting papers on its flora. All too soon were we hurried away from this naturalists' paradise to mix once more with the plain dwellers and forget the snow-clad slopes in a hot ride back to the capital of the Monaro.

I append a list of Coleoptera captured on the trip which, as mentioned above, does not profess to be an exhaustive one of the Kosciusko beetles:—

CARABIDÆ.—*Notonomus kosciuski* Sl., *N. muelleri* Sl., *N. rainbowi* Sl., *N. atripennis* Sl., *N. froggati* Sl., *N. sp.?* *Phorticosmus* Felix. Schaum., *Eurylychnus blagravei*, Castl., *E. dyschirioides*, Castl., 5000-6000ft.; *Promecoderus concolo*, Germ., *P. inornatus*, Macl., 3000ft.; *P. fletcheri*, 6000ft.; *Sarticus monarensis* Sl., *Idius mœstus* Chaud., 3000ft.; *Amblytelus curtus*, Fabr., *Adelotopus dytiscoides*, Newm., *Carenum bonelli*, Brulle, *C. laevigatum*, Macl., *Platynus marginellus*, Er., *P. marginicollis*, Macl., *Diapheromerus germari*, Cast., *D. sp.*, 3000ft.; *Lacordairia marginata*, Cast., 4000ft.; *Simodontus australis*, Dej., 6000ft.; *Hypharpax* sp., *Eudalia macleayi*, Bates., *E. n.sp.*, *Mecyclothorax ambiguus*, Er., *n.sp.*, 3000ft.; *Bembidium dubium*, Bl., 6000ft.; *Lithostrotus cœrulescens*, 3000ft.; *Notiophilis niger*, Bl., *Scopodes boops*, Er., *S. simplex*, 6000ft.; *Helluo carinatus*, Chaud., 3000ft.

DYTISCIDÆ.—*Necterosoma penicillatus*, 3000ft.

STAPHYLINIDÆ.—*Aleochara hæmorrhoidalis*, Guer., *Creophilus erythrocephalus*, Fab., *Philonthus nigrutilus* Gr., *Quedius* sp., 3000ft.

DERMESTIDÆ.—*Dermestes cadaverinus*, Fab., 3000ft.

LUCANIDÆ.—*Lamprima rutilans*, Er., 3000-5000ft; *Ceratognathus* spp. (2), *Figulus regularis*, Westw., 5000-6000ft.; *Aulococyclus edentulus* ? Macl., *Mastochilus* sp., 3000ft.

SCARABIDÆ.—*Onthophagus lucidicollis*, Kirby, O sp., 3000ft.; *Aphodius baldiensis*, Bl., 6000ft.; *Atænius speculator*, Bl., 3000-4000ft.; *Phyllotocus australis*, Boisd., *Cheiragra* sp., 3000ft.; *Diphucephala elegans*, Bl., 6000ft.; *D. pulchella*, Waterh., 3000ft.; *D. sp.*, 6000ft.; *Mæchidius latus*, C.O. Westw., *M. sordidus*, Boisd., 3000ft.; *Xylonychus* sp., 6000ft.; *Liparetrus* (several species), *Heteronyx* and allied genera, 7 different species not identified, 3000-6000ft.; *Eurychelus marmoratus*, Blanch., 6000ft.; *Anoplognathus hirsutus*, Burm., *A. montanus*, Macl., 3000-4000ft.; *A. pallidicollis*, Blanch., *A. pectoralus*, Burm., 3000ft.; *Repsinus æneus*, Fab., *Polystigma punctata*, Don., 3000ft.

BUPRESTIDÆ.—*Stigmodera ampliennis*, Saund., *S. crenata*, Don., *S. delectabilis*, Hope, *S. nasuta*, Saund.; *S. 8-maculata*, Saund.; *S. thomsoni*, Saund., *S. sp.*, 3000ft.; *S. sp.*, 6000ft.; *Cisseis* sp., 3000ft.

PTINIDÆ sp., 6000ft.

EUCNEMIDÆ.—*Lycaon* sp., 6000ft.

ELATERIDÆ.—*Lacon* sp., 6000ft.; *Monocrepedius aphiloides*, Sand., *M. spp.* (2), 3000ft.; *Crepidomenus fulgidus*, Er., *C. decoratus*, Er., 6000ft.; *C. australis*, Boisd., 3000ft.; *C. spp.* (3), *Chrosis* sp., 6000ft.

DASCILLIDÆ.—*Macrohelodes crassus*, Bl., *M. intricatus* ? Bl., 6000ft.

MALACODERMIDÆ.—*Metriorrhynchus rhipidius*, W.S. Macl., 3000ft.; *Telephorus pulchellus*, W.S. Macl., *Heteromastix* sp., *Hypattelus* sp., *Balanophorus brevipennis*, Germ., *B. cyanoptera*, Boh., *Helcogaster helmsi*, Lea, *Dasytes fuscipennis*, Hope, 3000ft.

CLERIDÆ.—*Tillus hilaris*, White, *Opilo congruus*, Newm., *Natalus porcatus*, Fab., *Aulicus lemoides*, Pasc., *Scrobiger splendidus*, Newm., *Eleale alboscuteolata*, Chev., *E. simplex*, Newm., *Stigmatium ventrale*, Macl., 3000ft.; *Lemidia nitens*, Newm., *L. subænea*, Gor., 6000ft.; *Pylus fatuus*, Newm., 3000ft.

BOSTRYCHIDÆ.—*Apate excavata*, Lea, 3000ft.

TENEBRIONIDÆ.—*Opatrum* sp., *Pterohelæus dispersus*, Macl., *P. nitidissimus*, Pasc., *Helæus tuberculatus*, Brème, *Saragus lævicollis*, Oliv. ? *S. rugosipennis*, Macl., *S. striatipennis*, Macl.,

3000ft.; *Nyctozoilus* sp., 3000-4000ft.; *Promethis angulata*, Er., *Meneristes servulus*, Pasc., 4000ft.; *Lygestira funerea*, Pasc., 3000ft.; *Lepispilus stygianus*, Pasc., *L. sulcicollis*, Bois., 6000ft.; *Titæna* sp., 3000ft.; *Cardiothorax aureus*, var. Cart. M.S., 4000ft.; *C. curvipes*, Bates? 3000ft.; *Dædrosis hirsuta*, Cart. M.S., *D. victoræ*, Bl., 6000ft.; *Adelium monticola*, Bl., 4000ft.; *A. porcatum*, 3000-4000ft., and other spp. *Adelium*, 4000-5000ft.; *Apasis puncticeps*, Lea, 5000-6000ft.; *Licinoma sylvicola*, Bl., 4000-5000ft.; *Coriperageminata*, Lea, *Chalcopterus* sp., 4000ft.; *Tyndaris longitarsis*, pasc., n. genus? 6000ft.

CISTELIDÆ.—*Tanychilus splendens*, Bless., *HomotrYSIS microderes*, Pasc., *Hybrenia* sp., 6000ft.

ANTHICIDÆ.—*Anthicus glabricollis*, King, 3000ft.

MORDELLIDÆ.—*Mordella leucostieta*, Germ., *M. æmula*, Lea, *M. spp.* (2) 4000ft.

CEDEMERIDÆ.—*Dohrnia miranda*, Newm., *D. simplex*, Champ., *Sessinia atkinsoni*, Waterh., 6000ft.

CURCULIONIDÆ.—*Acantholophus* n.sp., *Psalidura* n.sp., 6000ft.; *P. sp.*, *P. elongata*, MacL., 3000ft.; *Sclerorrhinus* n.sp., 6000ft.; *S. tristis*, Germ., 3000ft.; *Aterpus*, sp. 6000ft.; *Cubicorrhyncus* sp., 3000ft.; *Centyres*, sp., *Rhinaria* sp., *Evadodes* sp., 6000ft.; *Poropterus* spp. (3) 3000-6000ft.; *P. lissorhinus*, Lea, 6000ft.; *Cryptorrhynchides* n.sp., *Perperus* sp. (2), *Amisallus* sp., 6000ft.; *Gerynassa affinis*, Bl., *Haplonyx punctipennis*, Lea, *H. nigrirostris*, Chev.? *H. sp.*, 3000ft.; *Rhaciodes* sp., 6000ft.; *Mandalotus* sp., *Melanterius porcatus*, Er., 3000ft.; *Pachyura minima*, Bl., *Atelicus variabilis*, Lea, 6000ft.; *Cyttalia*, *sydneyensis*, Bl., *C. erichsoni*, Pasc., *Belus suturalis*, Boisd., 3000ft.; *Belus* sp., *Merimnetes* sp., *Desiantha* n. sp., 6000ft.; *Hyphæria assimilis*, Pasc., *Ethemæa sellata*, Pasc., 3000ft.; *Exithius* sp., 6000ft.; *Auletes* sp., *Læmosaccus* spp. (2), *Storens* sp., *Eristus* sp., *Ethas* sp., 3000ft.; *Gonipterus cionoides*, Pasc., 6000ft.

CERAMBYCIDÆ.—*Phacodes personatus*, Er., *Phoracantha fallax*, Pasc., *P. punctata*, Don., *P. semipunctata*, Fab., 3000ft.; *Epithora dorsalis*, W.S. MacL., *Allotisis discreta*, Pasc., *Coptocercus aberrans*, Newm., 4000ft.; *C. sp.*, *Adrium artifex*, Newm., *Macrones exilis*, Newm., ? gen. et sp.? *Athemistus* sp., *Syllitus grammicus*, Newm., 3000ft.

CHRYSOMELIDÆ.—*Cadmus aurantiacus*, Chp., *C. crucicollis*, var. boisd., *C. litigiosus*, Boh., *C. spp.* (2), 6000ft.; *Cryptocephala parenteticus*, Suff, 3000ft.; *Loxopleurus viridis*, Saund., *Rhyparida* sp., *Edusa* sp., 6000ft.; *Chalcolampra* sp., *Calomela ioptera*, Baly, 3000ft.; *Paropsis montana*, Bl., 6000ft.; *P. trimaculata*, Chp., 3000ft.; *P. melanospila*, Chp., *P. spp.* (5), *P. regularis*, Bl., 6000ft.

NOTES AND COMMENTS.

Mr. Thos. Steel, F.L.S., F.C.S., a member of our Club, has been re-elected President of the Linnean Society of N.S. Wales. We congratulate Mr. Steel upon the honour thus conferred upon him.

ANON writes:—"A few notes on a short visit to Byron Bay last January may possibly be of some slight service to such of your members as are interested in the subject. I can of course speak only of the particular season and time of year in which my visit took place, but at that period Byron Bay and its immediate neighbourhood were particularly poor in butterflies. About four miles out on the Bungalow Road there are some patches of underscrub, and when these are reached a considerable—and in some spots—large numbers of butterflies are found. Amongst the most common were *Danaus menippe*, Hübn., and *D. petilia*, Stoll.; the latter were apparently just coming out, as they were in very good condition. *Papilio sarpedon*, Linn; *P. leosthenes*, Doubld; *P. macleayanus*, Leach; *P. ægius*, Don.; and *P. anactus*, Macl., were also fairly numerous. Among the 'Whites,' *Elodina angulipennis*, Lucas, and a larger species which flew so high as to evade the sweep of my net, were also common. Unfortunately the latter never came close enough to allow me to distinguish it. Of the 'Blues' and 'Coppers' *Danis taygetus*, Feld., *Candalides absimilis*, Feld. and *Lucia lucanus*, Fab., were exceedingly numerous. Few 'Skippers' were about—possibly it was too early in the season. Of course the great attraction to a collector from the south is *Troides priamus richmondia*, Gray. The food plant, I understand, is usually given as *Aristolochia*, but as this does not grow wild nearly so far south as Byron Bay, there must be some other food. Specimens that I saw at rest were usually on trees, and one that I caught was on what looked like a species of fig. Specimens of this beautiful butterfly were hard to obtain as they were usually flying very high. I tried a female as a decoy, but without success, possibly because the males were not numerous. Under favourable circumstances, however, the plan would doubtless succeed, as I saw *P. macleayanus* drop like a stone down to the small 'White' fluttering some feet below. Anyone collecting in such a place should, in my opinion, certainly carry an extra joint or joints for his net stick to increase his reach if necessary, for it is irritating to have to stand helpless as I had to do on one occasion with a fine male *Troides* a few feet above my head, but as safe from capture as if he had been 50 yards away. On the railway, between Byron Bay and Murwillumbah, there is a place named Buringbah, which, as far as can be judged from the train, should be most excellent collecting ground, as there is much more scrub than near Byron Bay."

THE
Australian Naturalist.

VOL. I.

JULY, 1906.

PART 3.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE ORDINARY MONTHLY MEETING was held in the Board Room, 82 Pitt Street, on Thursday Evening, April 5th, 1906, Mr. Thos. Steel, F.L.S., F.C.S., in the chair.

ELECTIONS TO MEMBERSHIP.—Miss B. E. Griffiths, West Kempsey, N.S.W.; Miss P. Finckh, Mosman, Sydney; Messrs. H. E. Finckh, Mosman, Sydney; A. G. Hamilton, Willoughby, Sydney; and C. C. Lance, Strathfield, Sydney.

PAPER.—Mr. R. T. Baker, F.L.S., gave a short paper on "The Burtawang" (*Macrozamia* spp.). The antiquity of the Cycads was touched on, and the structure and special characters of *Macrozamia* were explained and illustrated by diagrams and specimens.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street, on Thursday Evening, May 3rd, 1906. The President, Mr. W. J. Rainbow, F.L.S., occupied the chair.

ELECTIONS TO MEMBERSHIP.—Messrs. E. J. Goddard, B.Sc.; Biological Laboratory, Sydney University; T. K. Swallow, Woollahra, Sydney; F. J. Wheeler, Lower Southgate, N.S.W.

PAPER.—Mr. C. F. Laseron read a paper on "The Geology of the Shoalhaven River District."

BIRDS EATING BUTTERFLIES.—At the previous meeting of the Club the above subject was under discussion, and it was contended that although some birds were reputed to attack and eat butterflies, little or no direct evidence had been published in support of the theory. It is interesting to record therefore that reliable observations have since been made, birds having been actually detected in the act. Mr. G. Goldfinch now reported that he had observed one of the honey-eaters, *Acanthorhynchus termitrostris* (spine-bill), attack, while on the wing, the "Dusky Blue," *Candalides hyacinthina*. The President said that during the last few weeks the "Glasswing," *Acræa andromacha*, had been very common around Sydney. On Easter Monday, his son, Mr. O. A. Rainbow, had netted several specimens. While engaged taking these specimens he noticed some of the common house sparrows chasing the "Glasswings." One of the latter, after being attacked, fell to the ground. Upon being picked up and examined, it was found to have been badly damaged. As the *Acræinæ* are regarded as inedible, the observation herein recorded is certainly interesting.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street, on Thursday Evening, June 7th, 1906. The President in the chair.

ELECTION TO MEMBERSHIP.—Mr. H. E. Baker, Gundy, N.S.W.

PAPER.—Mr. J. H. Maiden, F.L.S., read a paper on "Some Acacias of the neighbourhood of Sydney," with numerous mounted specimens and drawings in illustration.

A discussion on the function of the glands on some wattles and other plants followed. Mr. Gurney mentioned observing the common aphid-eating ladybird *Coccinella repanda* feeding on juice on the glands of the cow pea. This and other species are found on wattles and he thought it possible such predaceous species may rely on gland products for food in the absence of scale or aphid food.

THE GEOLOGY OF THE SHOALHAVEN.

By C. F. Laseyron.

A short time ago, accompanied by two friends, Messrs. Youll and R. Condy, I visited the Shoalhaven district. Our original intention, on first undertaking the excursion, was to proceed right up the river from Nowra, for a distance of about 80 miles, but, unfortunately, rain and a consequent fresh in the river, besides the fact that we were shorthanded, caused us to halt, and make a permanent camp at the junction of Yulwal Creek and the Shoalhaven, a point about 30 miles from Nowra.

The first feature of the district is its extreme roughness. We here stand, geologically speaking, on the edge of the great Permo-Carboniferous coal-basin. The Southern Plateau slopes gradually away to Sydney, owing to its gradual dip northwards. But on its Southern, or rather South-eastern boundary, it has been dissected by the Shoalhaven and its tributaries, leaving great gullies and gorges, striking monuments of the potency of river erosion aided by atmospheric denudation. The river, during a long period of slow upheaval, has cut its way right through the Permo-Carboniferous and into the Devonian, exposing along the river bank beautiful sections of unconformity.

The Devonian rocks are, on the whole, very devoid of fossils, and it was a considerable time before we found a fossiliferous horizon. In loose boulders of quartzite, in the bed of Yalwal Creek, we found *Pterinea*, *Leptodonius*, *Monticulipora*, etc., associated with *Rhynchonella pleurodon*. At the junction of Yalwal and Extrema Creeks we found fossils *in situ*, amongst which were *Avicula fosseletia* (?), *Sphenotus*, *Goniophora*, *Allorisma*, etc. On the Shoalhaven River, about four miles above its junction with Yalwal Creek, another outcrop was discovered, possibly continuous with the last. Here fossils

were obtained in the weathered portion of a very tough limestone, and consisted of *Euomphalus*, *Bellerophon*, *Naticopsis*(?), *Ctenodonta*, etc. All these fossils were, unfortunately, in a very bad state of preservation, but, nevertheless, they were interesting from the fact that they consisted chiefly of shells belonging to the Mollusca, a subkingdom not too well represented in the Devonian. At Grassy Gully there is an extensive series of rhyolites of Devonian age. These rocks are very silicious, in some places having the appearance of almost pure quartz.

Dealing next with the Permo-Carboniferous, we have two sub-divisions represented in the district. The Lower Coal Measures occur in an isolated patch at Yalwal Creek, underlying the Upper Marine Series, and resting unconformably upon the Devonian. They consist of alternating beds of shale and sandstone, and attain a thickness of about 40 feet. One horizon about midway in the series, contained fragmentary specimens of *Glossopteris*, *Gangamopteris*, and *Phyllothea*. The outcrop of these beds is usually hidden by talus slopes, consisting of portions of the Upper Marine escarpment above, undermined by atmospheric agencies. The Upper Marine Series at Yalwal Creek rest upon the Lower Coal Measures, but in other localities they lie directly upon the Devonian. At Grassy Gully they contain pebbles of the underlying rhyolites. We traced one interesting fossiliferous horizon from west of Yalwal Creek to Burrier, about 10 miles away. The sediments get finer and finer as we go eastward, with evidence of the proximity of land all along. The most interesting points along this horizon going eastward were as follows:

Yalwal Creek.—Coarse conglomerates with large specimens of *Edmondia nobilissima* and *Maconia elongata*.

Sugar Loaf, Western Side.—Coarse sandstones, containing *Spirifers*, *Martiniopsis*, *Dielasma*, etc.

Sugar Loaf, Northern Side.—Coarse sandstones with *Spirifers*, *Dielasma*, *Euomphalus*, etc.

Grassy Gully.—Fine sandstones and mud stones, containing *Spirifers*, *Dielasma*, *Productus*, *Aviculopecten*, *Aphanina*, *Pachydomus*, *Conularia*, etc.

Burrier.—Very fine shales, showing worm tracks, and containing fossil wood. Numerous fossils were obtained, lamellibranchs predominating. On this data I think we can fix the shore line of the Permo-Carboniferous sea at the time when these particular beds were laid down as running approximately east and west just south of the localities we investigated.

I must mention my indebtedness to Mr. J. G. Youll and Mr. R. Condie, who accompanied me on the excursion, and with whom many of the facts and ideas which I was fortunate to collect originated.

THE WATTLES OF THE COUNTY OF CUMBERLAND, N.S.W.

(By J. H. Maiden, Government Botanist.)

ACACIA is a large genus, the phyllodineous section of which is typically Australian. We have about 400 species in Australia, many having been described in Western Australia in particular during recent years. We have 122 described species and 35 varieties in New South Wales. In the County of Cumberland there are 28 species and 11 varieties, according to the following list:—

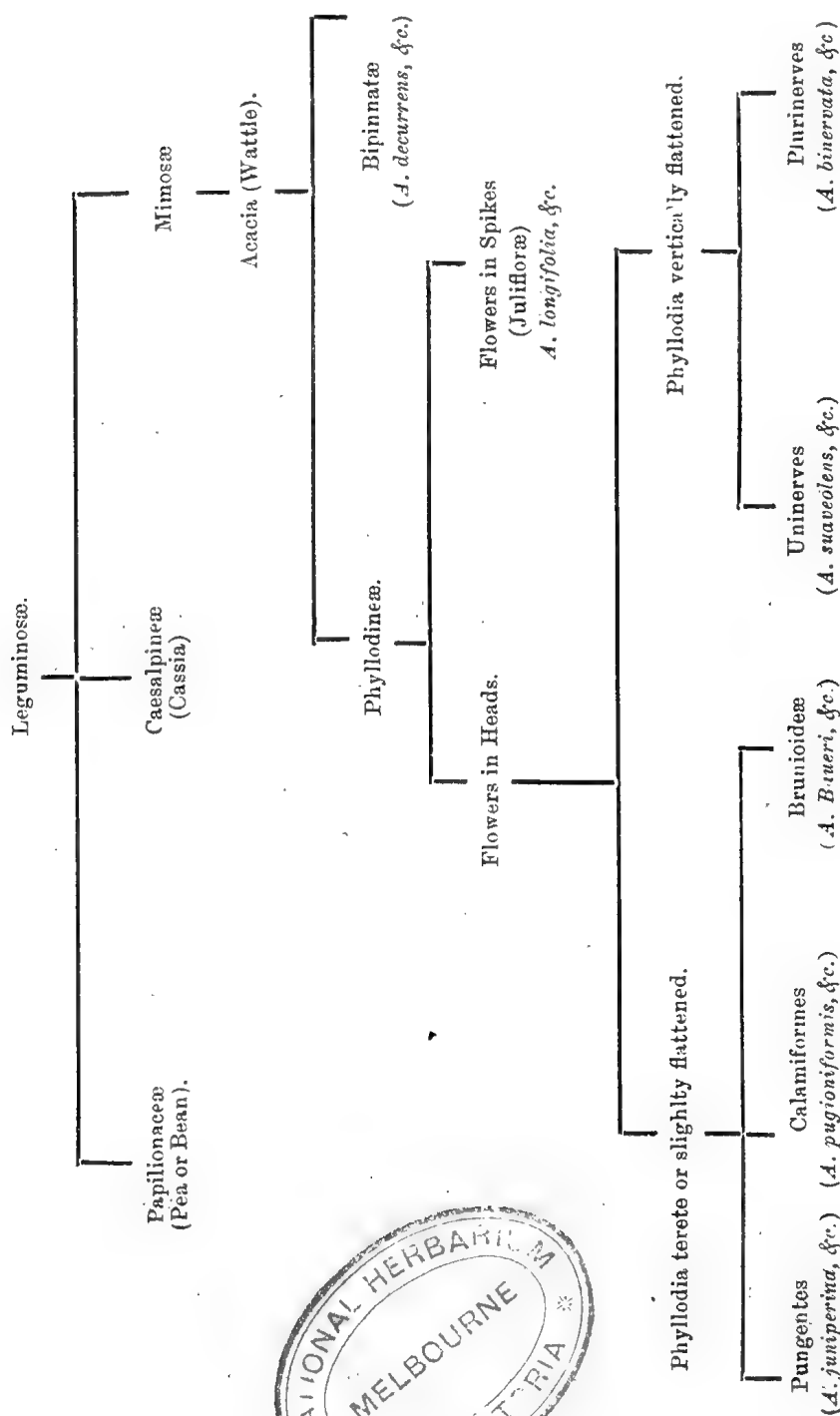
FLOWERS IN HEADS.

Section ii.—Pungentes: *A. pumila*, Maiden and Baker, *A. trinervata*, Sieb., *A. juniperina*, Willd., *A. juniperina* var. *Brownei*, Benth. Section iii.—Calamiformes: *A. pugioniformis*, Wendl. Section iv., Brunioidæ (or sub-section of Calamiformes)—*A. Baueri*, Benth. Section v.—*Uninerves*: Undersection i.—*Armata*: *A. armata*, R. Br. Undersection iii.—*Brevifoliæ*: *A. hispidula*, Willd., *A. undulifolia*, Fras., var. *pubescens*, Maiden and Baker; Undersection iv.—*Angustifoliæ*: *A. stricta*, Willd.; Undersection v.—*Racemosæ*: *A. falcata*, Willd., *A. rubida*, A. Cunn., *A. suaveolens*, Willd., *A. linifolia*, Willd., *A. linifolia* var. *prominens*, F. v. M., *A. lunata*, Sieb., *A. lunata* var. *crassiuscula*, Maiden and Bêche, *A. myrtifolia*, Willd. Section vi.—*Plurinerves*: Undersection ii.—*Oligoneura*: *A. elongata*, Sieb., *A. elongata*, var. *angustifolia*, Maiden and Bêche; Undersection iv.—*Nervosæ*: *A. melanoxylon*, R. Br., *A. implexa*, Benth.; Undersection v.—*Dimidiatæ*: *A. binervata*, DC.

FLOWERS IN SPIKES.

Section vii.—*Julifloræ*: *A. oxycedrus*, Sieb., *A. longifolia*, Willd., *A. longifolia* var. *sophoræ*, *A. longifolia* var. *floribunda*, *A. longifolia* var. *prostrata*, *A. linearis*, Sims, *A. glaucescens*, Willd., *A. Maideni*, F. v. M. Section viii.—*Bipinnatæ*: *A. elata*, A. Cunn., *A. pruinosa*, A. Cunn., *A. discolor*, Willd., *A. decurrens*, Willd. (*normalis*), *A. decurrens* var. *pauciglandulosa*, F. v. M., *A. decurrens* var. *mollis* (*A. mollissima*, Willd.), *A. decurrens*, Willd., var. *dealbata* (*A. dealbata*, Link.), *A. pubescens*, R. Br.

As the genus is so large, we must break it down for convenience of handling it and of recognising the various species. The following table (drawn up with especial reference to those found in the county of Cumberland) may help the young student:—



NOTES ON A LONGICORN BEETLE

(Euryassa Figurata, Pasc.)

By H. W. Cox.

This beetle is recorded from N. S. Wales and Queensland. It is common about Sydney, being found plentifully under the loose bark of *Eucalyptus punctata*.

Boring in the main trunk of a *Eucalyptus squamosa* at Port Hacking, a larva was obtained on April 10, 1902. It was $3\frac{1}{2}$ in. long and $1\frac{1}{2}$ in. in girth at the thoracic segments, and had the white colour and usual form of a longicorn larva; head and jaws black and dark brown in colour; posterior part of the head much sunken into the first thoracic segment, which is the broadest and largest segment of the body; the three thoracic segments each bear a pair of legs (ferruginous); abdominal segments distinct; of these the anterior seven are transversely vulcate on the dorsal and ventral surfaces, and the seventh is dorsally much elevated above the adjacent segments; the eighth and anal segments not sulcate.

This specimen pupated in October, 1904, and became adult in November, 1904.

At Hawkesbury River, on June 25, 1905, I found a piece of dry wood, probably of a *Casuarina glauca*, containing boring larvæ. The first adult emerged on December 3, 1905; it was an imperfect specimen. At this date another was in the pupal stage and measured 2 in. in length, becoming adult in January, 1906. Further investigation is necessary to ascertain the length of the larval stage. The Port Hacking specimen was alive in my possession for two years and seven months. Possibly growth was retarded by the drying of the piece of wood cut out with the grub. The Hawkesbury larvæ, however, were in dry wood, and seemed apparently about the same size as the Port Hacking larva, but they became adult within five and six months.

It is possible *Eucalyptus punctata* will be found to be the usual food plant of this species, as the adult beetles frequent this tree almost exclusively, and within the trunk are often to be found chambers larger than those made by *Stigmodera goryi* to which this tree is the food plant.

CURRENT LITERATURE.

By W. W. Froggatt, F.L.S.

During last year several important additions have been made to our knowledge of the Insect Fauna of Australia. T. D. Cockerell, who has been studying the collections of bees in the British Museum, has contributed a number of papers to *Annals and Magazine of Natural History*, 1904-5, entitled "Descriptions and Records of Bees," in which about 70 new Australian species are described. In 1904, Messrs. Perkins and Koebele,

of Hawaii, came to Sydney on a collecting expedition, afterwards going through Queensland as far as Cairns, looking for parasites of the sugar cane—Leaf-hoppers. Their collections have since been worked up by the staff of the Entomological Division of the Hawaii Sugar Planters' Association, and the results are published in ten parts. Bulletin No. 1 contains descriptions of a great number of new insects. Of these, 203 new species of Homoptera and 73 new genera are added to our list by Kirkaldy. Perkins describes seven new species of the family *Stylopidae*—minute creatures that in Europe are parasitic on bees, but in America, and now for the first time recorded from Australia, on frog-hoppers; he also describes 64 new Parasitic Hymenoptera, among which are 41 species of the *Dryinidae*; 26 species of the "Big-eyed Flies," family *Pipunculidae*, and seven species of the curious moths whose larvæ feed upon the waxy exudations of frog-hoppers, belonging to the family *Epipyropidae*.

EXCURSIONS.

POND LIFE IN CENTENNIAL PARK.

The Club's excursion, on April 7th, was made to Centennial Park for the purpose of examining pond life there. A fair number attended, and glorious autumn weather contributed somewhat to enjoyment of the expedition, whilst the number of interesting things observed touched all to a keen zest.

Submerged near the bank of the first pond approached was the little bladderwort *Utricularia*, a plant which has reversed the common rule of nature and devours animals instead of supplying them with food. A number of leaves of the plant are modified into little oval bladders: at the narrower end these bladders have an opening which is surrounded both externally and internally by stiff hairs, and is provided with a trap-door which opens inwards in such a way that little creatures can easily push their way in, but cannot get out again. It is mostly tiny crustaceans and the like that get caught, but some of the larger species of *Utricularia* trap even little fish. After many unavailing attempts to get out, the little captive dies, and its body soon breaking up, its substance is absorbed by the cells lining the bladder.

In the same pond, besides many Desmids and Diatoms, a plant called *Batrachospermum* occurred; this plant belongs to the *Rhodophyceæ* (red seaweeds), and is one of the three genera that occur in fresh water. In another pond, so large as to be a small lake, the water was coloured bright green, and on examination the colour was found to be due to small green *Algae* suspended in it. Every cubic inch of the water contained millions upon millions of these tiny plant cells: what

number the whole pond contained one cannot even faintly guess at. A microscopical examination showed that it was in the zooglœa stage—numbers of the little green cells embedded in a gelatinous matrix—and revealed its identity as *Botryococcus braunii*. When the cells multiplied by division they remained connected together in a string which wound round and round in a spiral or botryx: four-celled, eight-celled, sixteen-celled and many other stages were seen. Almost filling up the mouths of a number of drain pipes, opening into another pond, was a white stringy substance which proved to be the zooglœa stage of a Schizomycetes, probably a *Micrococcus*. The ground near this pond was inclined to be swampy, and we found there in flower some fine bushes of the mountain swamp *Grevillea acanthifolia*. It was the first time we had seen it growing anywhere but on the mountains; but we learned that it had been introduced by Mr Forsyth, the superintendent of the Park. On the carnivorous *Drosera binata* a plant bug was found, the habits of which were described some years ago by Mr. A. G. Hamilton in the *Town and Country Journal*. This bug is very common on *Drosera binata* on the Blue Mountains at such places as Govett's Leap, where one or more occurs on every plant; but it had not been seen near Sydney before. The bug, unidentified, belongs to the family *Lygæidæ*. It freely walks up and down the middle track of the sticky and (to small insects) dangerous leaves of the *Drosera*, and feeds on the insects which the plant catches. Another interesting bug was the water-boatman, *Enithares* sp., which has his second pair of legs developed into a splendid pair of oars. He lives under the water most of the time, and is a diver with a rare outfit, carrying down a bubble or two of air imprisoned under his small wings.

S.J.J.

MR. FINCKH'S AQUARIUM.

On Saturday, June 9th, the Club availed itself of an invitation by Mr. H. E. Finckh to visit his aquarium at his residence at Mosman, about 50 members and friends being present. The aquarium, besides being beautiful and interesting ornaments for drawing-room and greenhouse, exemplified well what can be done with very little expenditure and trouble in the way of keeping aquatic animals under observation, and was at the same time an excellent object lesson in this direction. Large accumulator jars, filled with water, and having a little garden soil strewn on the bottom, supported a varied growth of plants, amongst the stems of which brightly coloured fish disported themselves. In order to give the bottom a clean and tidy appearance, shell grit was spread over the soil, and this added largely to the general appearance.

Among the fishes there were the fan-tailed goldfish—a species which has been altered almost out of recognition under the patient care of Chinese and Japanese breeders. The Fighting-fish, *Betta pugnax*, and the Paradise fish, *Polyacanthus opercularis*, whose interesting habits have recently been described by Mr. E. R. Waite in the Records of the Australian Museum, were also on view, while of our native fish-fauna we noted the Striped Gudgeon, *Krefftius australis*; Gale's Carp Gudgeon, *Carrasiops galii*; Eel-gudgeon, *Galaxias* sp.; and the Blue-eye, *Pseudomugil signifer*. Plant life was represented by *Myriophyllum*, *Ceratophyllum*, *Vallisneria*, *Nitella*, *Anachyris*, *Marsilia*, and *Lemna*. Even more beautiful were the marine aquaria, bright as a fairy garden with expanded anemonies, corals, and tube-dwelling worms. Saucy little hermit crabs paraded fearlessly in and out the miniature forest of weeds, and grappled with prawns for toothsome morsels. Quite a number of pigmy leatherjackets, *Brachaluteres trossulus*, were seen daintily picking minute food particles from the mouths of the anemonies, and the peculiar movements of the Seahorses, *Hippocampus novæ-hollandiæ*, and Pipe-fishes, *Stigmatophora argus*, showed to advantage as they glided phantomlike from weed to weed. Among the specimens we noted a rare species of *Petrocirtes*, which was so tame as to feed from the hands. In addition to these, there were several other species, the enumeration of which is precluded out of consideration for space. Even frogs were included in the list of captives, and Miss Pearl Finckh drew attention to the interesting fact that if the land-loving species, *Pseudophryne libronii* accidentally jumps into water, it becomes quite helpless, and if not soon rescued drowns. During the afternoon Mr. Krefft gave an exhibition of the correct method of handling deadly snakes, and used for his purpose a lively specimen of the Tiger snake, *Notechis sentatus*, which with the aid of a forked stick he controlled and secured without danger to himself or his auditors. After partaking of afternoon tea on the lawn, Mr. Finckh gave a short address on the establishment and management of an aquarium, his remarks being listened to with interest. At the close of the afternoon, the President, on behalf of the Club, and all those present, thanked Mr. and Mrs. Finckh for their entertainment.

NOTES AND COMMENTS.

LADYBIRDS.—Mr. W. B. Gurney contributes the following:—At Richmond, N.S.W., specimens of *Coccinella repanda*, one of our common aphid-eating Ladybirds, were found feeding on some tiny glands on the stalks of *Cowpea*, but no aphids were seen on the plants. This and another, *Leis conformis*, are found on Wattles on which I know no aphids though several coccids are common on acacias. Is it possible the glands on stalks or leaves of some plants supply food for the predaceous ladybirds in the absence of scale or aphids?

HABITAT OF TWO ARANEIDS.—Two spiders have recently been collected by Mr. Moreau, at Antonio, via Rydal (Jenolan Caves District), which are of interest to those engaged in the study of our Arachnological fauna. The first of these, *Dolophones pilosa*, Keys, was originally recorded from Peak Downs, Queensland, and the second, *Arcys clavatus*, Keys., was described without any locality being given. Our knowledge of the range of the former is thus extended from Queensland to New South Wales, and in respect of the second a definite locality is now established.

ARMIDALE NATURAL HISTORY CLUB.—A Natural History Club has recently been established at Armidale, under the presidency of Mr. J. Newbury. At a recent meeting the president delivered an address on "Bees"; this has been followed by a paper on "Butterflies and Moths," by Mrs. Ross, who not only exhibited a number of specimens of the insects referred to in her paper, but also some water-colour drawings, illustrative of life histories. An interesting collection of Ichneumonidæ was exhibited by Mr. Cory. It will be seen from this that our northern friends are doing good work, and it would be well if other centres were to fall into line and emulate the example set. Our native fauna and flora is not only vast, but exceedingly diverse, and although much excellent work has been accomplished, there is still much more to be done. Field workers are always welcome, and the establishment of such clubs as the Armidale Natural History Club must be of great service in the cause of biological science.

LIST OF MEMBERS.

The list below gives the complete membership of the Club at the present date. It is printed with addresses to allow of mutual correspondence and exchange of specimens. Against the names of some members their special object of study is indicated, though this does not preclude correspondence on matters of general interest.

Members are urged to at any time communicate one with another, or with the Hon. Secretary, on the subject of Natural History or the affairs of the Club. The aims of the Club should be made known as widely as possible, and nominations for membership are always desired.

W. B. GURNEY, Hon. Sec.

ABRAHAM, L., 90 Redfern St., Redfern (*Insects*).

Andrews, C. F., B.A., Geological Survey Branch, Dept. of Mines.

Arnold, Edwin, B.A., Technical College, W. Maitland (*Botany & Insects*).

BAKER, H. E., Public School, Gundy, via Scone, N.S.W. (*Insects*, *Botany*, etc.)

Baker, R. T., F.L.S., Curator, Technological Museum, Sydney.

Bauerlein, W., Technological Museum, Sydney.

Betche, E., Botanic Gardens, Sydney.

Biden, E. H., Summer Hill, Sydney (*Shells*).

Biden, W., " " (*Shells and Insects*).

Blackmore, J. J., Public School, Balranald, N.S.W.

Brazier, John, 65 Camden St., Newtown (*Shells*).

Brennan, Miss L. O., M.A., B.Sc., 372 Moore Park Rd., Paddington.

Brewster, Miss A., Church St., W. Maitland, N.S.W. (*Geology & Botany*).

- Brown, F., Bondi Rd., Bondi.
 Brown, J., 42 Arthur St., Ashfield.
 Burges, J. C., Superior Public School, North Granville (*Hemiptera and Flies*).
 CAHILL, D., Public School, Yarrangobilly. via Tumut, N.S.W. (*Insects*).
 Carruthers, A. J., Wollongong Rd., Arncliffe (*Shells*).
 Carter, H. J., B.A., "Ascham," Darling Point, Sydney (*Beetles*).
 Cayzer, A., Carlyle St., Leichhardt.
 Chandler, Miss, Phillip St., Sydney.
 Clayton, Miss M. J., c/o Mr. J. R. Garland, 56 Elizabeth St., Sydney
 (*Botany*).
 Clayton, Miss N. " " " "
 (*Botany*).
 Cole, Miss S. R., Medowie, N.S.W. (*Birds and Insects, etc.*).
 Coles, C., Taxidermist, Victoria Arcade, Sydney (*Natural History generally*).
 Combes, Charles, Fonthill, Lake Bathurst, N.S.W. (*Insects, etc.*).
 Cormick, Jas., Electricians' Dept., G.P.O., Sydney.
 Cotton, G. R. C., Palser St., Woolwich, Sydney.
 Cox, H. W., 206 Liverpool St., Sydney (*Beetles*).
 Culpin, E., 205 Bridge Rd., Glebe.
 DART, John, Public School, Croydon, Sydney.
 Davis, R. W., "Chevy Chase," Croydon, Sydney.
 Dawson, Henry, Solicitor, Elizabeth St., Sydney.
 Dixon, Hugh, "Abergeldie," Summer Hill, Sydney.
 Dovers, Geo., Albert St., Petersham (*Birds*).
 Dovers, W. A. " "
 Dun, W. S., Geological Survey Branch, "Mines Dept., Sydney.
 EDWARDS, H. V., Military Rd., Mosman, Sydney.
 FERGUSON, E. W., Paxton House, Glebe Point, Sydney.
 Finckh, H. E., "Hermes," Raglan St., Mosman (*Pond Life*).
 Finckh, Miss P. " " (*Beetles and Butterflies*).
 Flecker, H., 152 Bridge Rd., Glebe (*Shells*).
 Fletcher, J. J. M.A., B.Sc., Secretary, Linnean Society, Elizabeth Bay, Sydney.
 Froggatt, W. W., F.L.S., Govt. Entomologist, Dept. of Agriculture, Sydney.
 GARLAND, J. R., M.A., 56 Elizabeth St., Sydney (*Botany*).
 Gilbert, P., 9 Forbes St., Redfern (*Hymenoptera*).
 Goddard, E. J., B.Sc., Biological Laboratory, University, Sydney
 (*Leeches, Sponges, etc.*).
 Goldfinch, G. M., Effingham St., Mosman (*Butterflies*).
 Gould, E. T., Public School, Verona, via Quamma, N.S.W. (*Marine Specimens generally*).
 Grant, F. C., Union Bank, Pitt St., Sydney (*Crustacea*).
 Grant, Robt., Board of Health, Macquarie St., Sydney.
 Griffiths, Miss B. E., Public School, West Kempsey, N.S.W.
 Gurney, Wm. B., Entomological Branch, Dept. of Agriculture (*Grasshoppers and Insects generally*).
 Guthrie, Dr. T., c/o Colonial Sugar Refining Co., O'Connell St., Sydney
 (*Butterflies*).
 HAMILTON, A. G., Public School, Willoughby, Sydney (*Botany*).
 Harris, Miss M., B.A., B.Sc., "Bulwarra," Ultimo, Sydney.
 Harris, Miss B., "Bulwarra," Ultimo, Sydney.
 Harrison, L., "Sparta," Kangaroo Hill, Manly (*Birds' Skins and Eggs*).
 Harrison, R. L. " "
 Haswell, Prof. W. A., M.A., D.Sc., F.R.S., "The University, Sydney.
 Hedley, Chas., F.L.S., Australian Museum, Sydney.
 Hill, Dr. J. P., The University, Sydney.
 Holme, E. R., B.A., The University, Sydney.
 JENSEN, H. J., B.Sc., Macleay Scholar, The University, Sydney.
 Jensen, J. G., "Spurson," Neutral Bay, Sydney.
 Johnston, S. J., B.Sc., B.A., Technological Museum, Ultimo (*Lizards*).

- Johnston, Mrs. S. J., "Ellerslie," Toxteth, Glebe Point.
 KREFFT, H., 152 Jersey Rd., Paddington (*Snakes and Lizards*).
 LANCE, C. C., "Wrangthorn," Strathfield.
 Laseron, C. F., 81 Berry St., North Sydney (*Fossils*).
 Linthorne, J. B., The Terminus, Marrickville.
 Lodder, Miss, Tasmania.
 Longmuir, G. F., 220 Johnstone St., Annandale.
 Lucas, A. H. S., B.A., B.Sc., Sydney Grammar School, Sydney.
 MACK, Miss G., Citizens' Life Chambers, Moore St., Sydney.
 Mackinnon, E., University, Sydney.
 Maclean, Miss, Glenmore House, Morris St., Summer Hill.
 Maiden, J. H., F.L.S., Botanic Gardens, Sydney.
 McMillan, R., c/o Messrs. W. Brooks & Co, Castlereagh St., Sydney.
 Meares, Miss, Riviere College, Nelson St., Woollahra.
 Morehouse, G. A., J.P., Carey St., Marrickville.
 Mort, H. S., B.Sc., "Trevelyn," Ocean St., Woollahra.
 Murray-Prior, Miss M., Women's College, Bligh St., Newtown.
 NORTON, Hon. Jas., LL.D., "Ecclebourne," Double Bay.
 OAKES, Miss F. M., University, Sydney.
 PALMER, E. G. W., Boulevard, Lewisham.
 Paradise, Miss M., Gibbs St., Croydon.
 Parkes, Miss, "Hampden," Johnstone St., Annandale.
 Parkes, Miss L.
 Pfeiffer, E. T., Public School, Nelligen, N.S.W. (*Insects*).
 RAINBOW, W. J., F.L.S., F.E.S., Entomologist, Australian Museum, Sydney.
 Richardson, D. G., Superior Public School, Waterloo.
 Riley, G. D., Superior Public School, Rookwood (*Fossils*).
 Robertson, Douglas, c/o Messrs. Angus & Robertson, Castlereagh St., Sydney.
 SANDERS, Miss, Dension St., Woollahra.
 Scrutton, Miss C. M., Croydon St., Petersham (*Minerals*).
 Seaward, W. T., Miranee, Gundy, N.S.W. (*Minerals*).
 Shaw, P., "Epcombs," Miller St., N. Sydney.
 Sloane, T. G., Moorila, Young, N.S.W. (*Carabidae*).
 Stead, David G., Fisheries Dept., Domain, Sydney (*Fishes*).
 Steel, Thos., F.L.S., F.C.S., Colonial Sugar Refining Co., O'Connell St., Sydney (*Peripatus and Land Planarians*).
 Steffanoni, Miss A., "Braemar," Riley St., N. Sydney (*Minerals*).
 Stewart, F. E., Public School, Dilga, via Cumnock, N.S.W. (*Minerals*).
 Stewart, J. S., Mechanics' Institute, Gundy, N.S.W.
 Stoyles, B. L. C., 165 Chapel St., Marrickville, Sydney (*Insects*).
 Sussmilch, C. A., F.G.S., Lecturer in Geology, Technical College, Sydney.
 Swallow, T. K., "Amaroo," Adelaide Parade, Woollahra, Sydney.
 TAYLOR, R. L., Fisheries Dept., Domain, Sydney.
 Taylor, G. M., Examiners' Branch, Dept. Public Instruction, Sydney.
 WALKOM, A., "Woodside," Albert St., Ashfield.
 Walkom, A. J., Electricians' Dept., G.P.O., Sydney (*Shells and Fossils*).
 Waterhouse, G. A., B.E., B.Sc., The Royal Mint, Sydney (*Butterflies*).
 Waterhouse, G. J., "Ellerslie," Birrell St., Waverley, Sydney.
 Waterhouse, Mrs. G. J.
 Watts, Rev. W. W., The Manse, Young, N.S.W. (*Mosses*).
 Wearne, Miss, Ladies' College, Burwood, Sydney.
 Wheeler, F. J., Public School, Lower Southgate, Clarence R., N.S.W. (*Reptiles, Insects, etc.*)
 White, Henry L., "Belltrees," Scone, N.S.W. (*Birds and Mammals*).
 White, P. J., Public School, Midway, via Attunga, N.S.W.
 Wilson, Prof. J. T., Medical School, Sydney University.
 VAUGHAN, H., Young St., Croydon, Sydney (*Butterflies*).
 Vickery, G. B., 78 Pitt St., Sydney.

Australian Naturalist.

VOL. 1.

OCTOBER, 1906.

PART 4.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday Evening, July 5, 1906, the President, Mr. W. J. Rainbow, F.L.S., in the chair.

ELECTION TO MEMBERSHIP.—Messrs. H. L. White, Scone; E. Arnold, B.A., W. Maitland; and R. W. Davies, Croydon.

LECTURE.—Mr. E. J. Goddard, B.Sc., delivered an address on "Microscopic Forms of Pond Life," illustrated by lantern and micro-lantern slides.

SPECIAL MEETING.—A SPECIAL GENERAL MEETING was held at 7.30 p.m. on Thursday, August 2, 1906, the President, Mr. W. J. Rainbow, F.L.S., presiding. The meeting was convened for the purpose of amending Rule 8 to include the hon. editor as an *ex officio* member of the Council, which was carried; also to consider rules suggested by the Council for the formation, regulation, and guidance of country branches of the Club. These having been read, were put to the meeting, and adopted.

ANNUAL MEETING.—THE ANNUAL MEETING was held at 8 p.m., the President, Mr. W. J. Rainbow, F.L.S., in the chair. The Annual Report of the Council, and the Hon. Treasurer's balance sheet were read and adopted, after which the retiring President delivered an address—"A Study in Natural Selection."

ELECTION OF OFFICERS.—The officers and Council for the ensuing year were elected as *per list* on cover.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday Evening, September 6th, 1906. The President, Mr. G. A. Waterhouse, B.Sc., B.E., in the chair.

ELECTIONS TO MEMBERSHIP.—Dr. Mary Booth, Sydney; Messrs. J. G. Lockley, Killara; G. P. Burgoyne, Mosman; C. Thackeray, Sydney; and Dr. W. G. Woolnough, Sydney University.

BUSINESS.—Mr. S. J. Johnston, B.Sc., delivered a short address on the method of preparing, cutting, and staining animal and botanical sections for permanent mounts for microscopic slides, and illustrated his remarks by practical demonstration. A large number of specimens were displayed by the lecturer; also by Messrs. Steel, Froggatt, Rainbow, Garland, Taylor, Mackinnon and Hamilton, all of whom brought microscopes and slides of biological and mineralogical interest. In addition to these, Mr. Coles exhibited some rare shells (*Cypræa spp.*), and Mr. Stead species of Pipe Fish.

SIXTH ANNUAL REPORT.

The Council have, in this report, to announce the continued success of the Club during the sixth year, which ended on the 31st July, 1906.

The Fifth Annual Meeting of the Club was held on August 3rd, 1905, when a large number of members and visitors were present. The retiring President, Mr. W. W. Froggatt, F.L.S., read an address on "The Aims and Usefulness of Field Naturalists' Societies." This was published in the first number of our journal—THE AUSTRALIAN NATURALIST.

During the year ten Ordinary Meetings were held in addition to the Annual Meeting, at which papers and notes were read, practical demonstrations given, and specimens exhibited. The titles and, in some instances, abstracts of the papers have been published in the journal from time to time. The evenings devoted to demonstrations were well attended and much appreciated. It is the intention of the Council to devote other evenings during the ensuing year for practical demonstrations and instruction, as it is felt that such are of the highest value and importance.

During the year the Library has again received numerous additions, and to render it more readily available to members the Hon. Librarian is preparing a card catalogue of the volumes.

The first issue of THE AUSTRALIAN NATURALIST was published in January of the present year, and the second and third issues in April and July respectively. These parts were issued under the editorship of Mr. Rainbow. The publication of this journal supplies that medium needed by the Club for the printing of papers and notes on our fauna and flora. Although our official organ is small at present, it is hoped that with the increase of membership and funds, the Council will not only be able to enlarge and illustrate it, but also to increase the number of parts issued during the year.

Your Council desire to congratulate the Club on its progress during the year. Our ranks have been augmented by the election of 21 ordinary and 15 country members. Five members have been lost by resignation and two by death, so that the total number on the roll on the 31st July, 1906, was 122. The Council deeply regret having to record the deaths of Mr. J. F. Morris, B.E., F.G.S., and the Hon. Dr. James Norton, LL.D., M.L.C.

The Council, while regretting the loss sustained by the departure from Australia of Mr. Edgar R. Waite, F.L.S., and Dr. J. P. Hill, nevertheless desires to congratulate those gentlemen upon their respective appointments.

Collections of insects and minerals have been received from time to time by the Hon. Secretary from country members for

determination; these were duly handed to those into whose departments they fell, and after examination were returned with the information sought for. Several boxes of insects, shells, and other marine specimens desired and requested by country members were supplied.

The Council has again to record its indebtedness to Mr. Garland for kindly granting the use of his office for its meetings.

In conclusion the Council desires to point out that there is room for advance in our membership, and with it the extension of the scope of the Club's work.

W. J. RAINBOW, President.

WM. B. GURNEY, Hon. Sec.

31st July, 1906.

A STUDY IN NATURAL SELECTION.

(Abstract of Presidential Address by W. J. Rainbow, F.L.S., F.E.S., at the Annual General Meeting, 2nd August, 1906.)

ONE of the most interesting chapters in the Study of Natural Science is that which comes under the heading of "Attack and Defence." So far as spiders and insects are concerned, it is unnecessary to enlarge upon their need of means of defence, because there are no creatures more open to attack, and this owing to their peculiarly defenceless conditions. I intend to-night to speak mainly of spiders, partly because so few really study them, and partly because, in the active field of natural science, these animals were the first to claim my undivided attention.

In studying the question of Attack and Defence, there are two main factors to be taken into account, viz., Colouration and Formation. In "Tropical Nature" Wallace divided "Organic Colours" in animals into four groups:

1.—Protective Colours.

2 — Warning Colours. $\left\{ \begin{array}{l} (a) \text{ of creatures specially protected.} \\ (b) \text{ of defenceless creatures mimicking } a. \end{array} \right.$

3.—Sexual Colours.

4—Typical Colours.

For the purposes of my address, I purpose to divide spiders into the following groups: 1, Protective colouration; 2, Protective formation; 3, Those that mimic (a) animate and (b) inanimate objects; 4, Those whose colours are attractive; and 5, Warning colours.

Now, considering the dangers with which all soft-bodied animals are beset, the question of protection, whether it be by colouration or formation, or by a combination of both, is in the

highest sense essential to their safety and well-being. If it were not for this many species, owing to the vigilance, and often superior strength of foes, would become extinct, and so the balance in nature would be disturbed. Protective colouration and formation may often be linked together, for although many of our native spiders are protected by colour merely, others complete the disguise by simulating as well the shape or form of neighbouring objects, such as broken shells or pebbles on our sea beaches, the excreta of birds, or buds and twigs in the forest; colouration and formation when they aid in shielding an animal, may be summed up in one term—protective resemblance. The most usual form of protective resemblance is that of simple concealment. The animal simulates, more or less exactly, the appearance of some object that is of no interest to its enemies, and so passes undetected; or it harmonises in a general way with its surroundings, and so succeeds in eluding attention. Protective resemblance is that in which an animal imitates an inanimate object; mimicry, on the other hand, implies that an otherwise defenceless animal mimics more or less accurately an animal that by some reason is protected from its enemies, or even an animal that preys upon its class.

In the spider world members eat as they are eaten. Some of them are active and some sedentary. To each of these classes colour is of vast importance. By its aid the former are enabled to stalk prey undetected, while the latter, when danger threatens, may take cover and remain hidden until all is safe. The principal of adaptive colouration, though early recognised, found no intelligible exposition until Darwin, in 1859, explained it in his theory of Natural Selection. Formerly, one school of investigators referred it to an originally created specific peculiarity; while another declared it to be due to the direct action of climate, food or soil. Even at this date there are those who still hold one or the other of these views. Both arguments are untenable, the former because it raises a bar to reasonable and intelligent inquiry, and the latter because it fails to satisfactorily explain all the varied phases and phenomena, and is, moreover, contraverted by well-known facts. The gradually increasing change of disguised species from a general harmony with surroundings to precise imitation of particular objects, is rather to be accounted for by the laws of a struggle for existence, and the consequent survival of the fittest. Protective colouration cannot be fully understood by persons who have given no study or consideration to the varying tints of nature. To see a brilliant specimen in a cabinet is one thing, but to note it in the bush, amid its natural surroundings, is altogether another. Indeed, the vivid colour that makes an animal conspicuous in a collection, is often

the very agent by which it secures protection in the forest. The explanation of this is that we are prone to fail adequately to appreciate the tones and tints of inanimate nature, and that we often make little or no allowance for the infinite variations and complications caused by the ceaselessly changing plan of light and shade upon colours which of themselves are far from un-form. Few spiders could appear more conspicuous when viewed in the cabinet than *Misumena lactea*, or its variety *tristania*, yet upon certain plants these are rarely detected unless in motion. The former is, as its name implies, milky white, and it invariably hunts its prey upon plants that bear white flowers, while the latter lurks among the golden blossoms of *Tristania laurina*. Moreover, both, when at rest, pose their bodies in such a manner as to add to the general effect. The resemblance in each case must be regarded as protective and attractive—the former because it assists the Arachnid in evading natural foes, and the latter because it attracts insects upon which the spider feeds. Many spiders that are remarkably conspicuous when resting in their webs are practically hidden when resting on a leaf or twig, the hues of which harmonise with their own. Among arboreal species all shades of green, brown and grey occur. Some simulate bits of stick, withered leaves, and others green leaves or buds with mock holes as though attacked by leaf-eating insects or bud-burrowing worms. Governed by the law of Natural Selection, tints of animals frequently undergo modifications in order to adapt the latter to altered conditions of surroundings. In tracks of bush that have been fire-swept, specimens are found so closely resembling charred branches or bark, that unless in motion it is impossible to detect them. Mr. A. T. Urquhart, a well-known naturalist, has noted the same phenomenon in New Zealand. The habit of lying motionless when alarmed is common with some species, while others drop out of their webs, and falling to the ground, feign death. Numerous species of *Gasteracantha* are admirably protected. Individuals of this genus have a hard chitinous body armed with sharp stout spines, and although exposed positions are always chosen, no bird or lizard ever molests them.

It is well known that hairy caterpillars are immune from the attack of birds and lizards, and that is the reason they are so common. Numbers of spiders are similarly clothed, and many of these are amongst the most uncanny of their class. Examples of these may be collected wherever there is any bush. The obnoxious odours and flavours of some insects, as in butterflies of the *Danaidæ* and *Heliconidæ*, render them safe from the raids of natural enemies. Thus, Thomas Belt, in his delightful work "The Naturalist in Nicaragua" tells us that when he tried to feed his pet monkey with some of the latter,

the ape would take them when offered, smell them, pull a wry face, roll them up in his hand, and drop them quietly in a few minutes; further, when he placed one of these butterflies in the web of a species of *Nephila*, the spider would drop it out; another species, that had apparently acquired the taste, appeared to eat such as became entangled in its web.

Quite a number of spiders, both ground-runners and tree-dwellers, mimic different species of ants. Not only do they closely resemble the latter in form and colour, but even in their manner of running about; and what is most extraordinary, the ant-like spider carries its first pair of legs in such a manner as to simulate the antennæ of the particular Formicid insect in whose company it is found. Among our native species there are a number of spiders that mimic small tree-dwelling ants, and others certain Camponotidæ or Sugar Ants. Tull Walsh in his memoir, "Protective Resemblance in Spiders," says: "I have noticed that the spiders are probably protected from birds and other enemies by their resemblance to ants, but there can be no doubt that frequently they also gain another very considerable advantage. The ants with which these spiders most do congregate are fairly omnivorous feeders, but show a decided preference for sweet juices often to be found exuding from trees, fruit or flowers. To these juices come also flies, small beetles, and other insects which form the natural prey of the spiders, and which do not, under the circumstances, particularly fear the ants. Thus, while the flies are sucking up sweetness in company with the ants, the spider is, no doubt, able under its disguise to approach near enough to make a spring upon the unsuspecting victim, and to fix its sharp falcæ into its victim's body. As regards the ants themselves, they do not seem to take any notice of the spiders, and do not apparently attack them." Personally, I am convinced the ants have little to fear from the spiders; for, although I have watched closely on many occasions, I never yet saw an ant attacked by a spider that mimicked it. Indeed, the natural ferocity of ants, their hardness of body, and faculty of combining to withstand assault, would tend to show that spiders were more likely to be attacked by the ants than that the latter would be attacked by the spiders. This view was held by Mr. Belt, who observed: "Ants, and especially the stinging species, are, so far as my experience goes, not preyed upon by any other insects. No disguise need be adopted to approach them, as they are so bold that they are more likely to attack a spider than a spider them. Their real use is, I doubt not, the protection the disguise affords against insectivorous birds. I have found the crops of some humming birds full of soft-bodied spiders—and many other birds feed upon them—but I never saw any ants or ant-like

spiders. Stinging ants, like bees and wasps, are closely resembled by a host of other insects; indeed, whenever I found any insect provided with any special means of defence, I looked for imitative forms, and was never disappointed in finding them."

Just as there are amongst insects and other animals many that possess what are termed "warning colours," so also there are spiders. Animals possessing warning colours are either dangerous or objectionable to enemies of their class, and hence are rarely attacked. Bright and striking colours, such as red, may be described as a "danger signal,"—an intimation that the creature possessing it had better be left alone. Many spiders are brightly coloured, and these include the boldest and fiercest of their class. Two examples out of many will suffice. One is the powerful *Erioden rubricapitatum* and the other *Latrodectus hasselti*. Of these the former has the first half of its body brilliant scarlet, and the latter its abdominal portion a bright satiny black with a broad central band of scarlet, with, sometimes, scarlet lateral stripes. Such colours, one would think, would naturally attract attention, and in attracting, have a tendency to lead to extinction. Yet these spiders are very common. Their bodies are never found in the crops of insectivorous birds nor, so far as I can find, in the nests of wasps. Small lizards are fond of eating spiders, and devour a great many, yet they do not appear to attack *Latrodectus*. Of this I have some proof, for a small lizard that I kept for some time ate all the spiders I gave it except the red-striped species, and that it would not touch on any account. Animals possessing warning colours do not always wholly escape. Speaking on this side of the subject Professor Poulton says: "It is probably unnecessary for the young insect-eating animal actually to make a trial of every species of nauseous insect in its locality in order to be equipped with an efficient stock of experiences with which to conduct its later life. Such an education would be somewhat dearly bought; it would be unpleasant to the insect-eater and destructive to the insect. Since, however, the same colours are employed again and again by unpalatable or dangerous insects of very different groups, and since the patterns are also frequently repeated, it is obvious that a comparatively few unpleasant experiences would be sufficient to create a prejudice against any insect with a colour or pattern at all resembling the nauseous forms which had already produced so deep impression upon the memory." Experiments have proved that "the colours which produce the greatest contrast, and therefore the greatest effect upon the eye of an insect-eating vertebrate, are black and white, and next to this black (or some very dark colour) and yellow,

orange, or red ; and it was found that nearly all unpalatable or dangerous insects were coloured with these tints."

It is impossible, in the short time at my disposal this evening, to do more than touch upon the subject. I think, however, that I have said sufficient to demonstrate the importance of colour and form as protection on one hand and warning on the other. My hope is that members interested in this question will carefully note and duly record such examples as may from time to time come under their notice. [Some interesting exhibits, illustrative of this subject were displayed by Messrs. Steel, Harrison, Stead, Gurney and Riley. These consisted of birds, fish, spiders, and insects.]

AQUATIC INSECTS IN SALT WATER.

DR. C. CHILTON, M.A., F.L.S., Professor of Biology at Canterbury College, New Zealand, records in Vol. xxxviii. of the "Transactions of the New Zealand Institute," having taken a specimen of the widely-distributed *Rhantus pulverosus*, Stephens, in rock-pools at Island Bay, Wellington, N.Z., while collecting marine forms. Only one specimen was seen, but it seemed quite at home, and was behaving just as it might have done in fresh water. As this species is common in Australia, it would be as well if our local collectors would keep a look-out for it, and other water beetles, in such like localities. Darwin, in his "Voyage of the *Beagle*," recorded having found several live water beetles swimming in the ocean seventeen miles from land, off Cape Corrientes, and considered that they had probably been floated into the sea from a small stream which drains a lake near the Cape ; he also recorded having found a species of *Hydrophilus* in a lagoon near Rio Janeiro, in which the water was only a little less salt than the sea. Dr. Chilton considers occurrences of this kind as of special value in the explanation of difficult questions that may arise in connection with geographical distribution. In addition to the above instances, a specimen of an aquatic Hemipteron, *Nepa rubra*, Linn., was found by Mr. Thos. Steel, F.L.S., some years ago, swimming, evidently quite at home, on the harbour at Rose Bay, Port Jackson.

DESTRUCTION OF NATIVE FAUNA.

The following remarks on the destruction of our native fauna, made by Mr. Thos. Steel, F.L.S., President of the Linnean Society of N.S.W., in the course of his address at the Annual Meeting this year, will be read with approval by the members of the N.S.W. Naturalists' Club :—

A matter which calls for the active attention of all lovers of nature in Australia is the preservation of the native fauna. The indiscriminate and wanton destruction of birds and mammals which is now going on over the length and breadth of the land is appalling. It is bad enough when introduced pests like the fox are threatening the absolute extinction of such characteristic birds as the lyre-bird, but when to this is added the meaningless slaughter, for the mere sake of killing, of anything, be it bird or mammal, which is capable of being shot, by the so-called sportsman, it is surely time to call a halt. A member of this Society put the case excellently when, in speaking of the purposeless killing of the native bear, he said:—"A man who can go and shoot bears for the fun of it should feel at home with a gun among a flock of sheep." To this must be added the inadvertent destruction of native animals through poison laid for rabbits. By the careless use of poison, either in baits or in water, enormous numbers of our native mammals and birds are being killed, and as the latter include some of the most valuable insectivorous species, their destruction must have its inevitable result in the undue multiplication of noxious insects which will exact a heavy toll from the crops of the agriculturist. As a community we seem strangely slow to learn by experience. The introduction of sheep and cattle, to say nothing of rabbits, has been a profound factor in altering the balance of nature in Australia, and when in addition useful and harmless creatures alike are persecuted out of existence in a spirit of mere idle brutality, it is little to be wondered at that nature retaliates in no uncertain way.

CURRENT LITERATURE.

By the Editor.

WORKERS in the various fields of biological research continue as active as ever, and so far as Australian naturalists are concerned, new recruits are entering the field. Among the latter we note, and welcome, Mr. Allan McCulloch, of Sydney, who in collaboration with Mr. F. E. Grant, F.L.S., has recently contributed to the Proceedings of the Linnean Society of New South Wales, Part I., 1906,—a valuable memoir. The paper quoted, "On a Collection of Crustacea from the Port Curtis District, Queensland," by F. E. Grant, F.L.S., and Allan R. McCulloch, is the first of an interesting series by these co-workers that will be fully appreciated by all interested in this branch of zoological investigation. For many years our native Odonata had been a neglected group, but this is now being worked up by Mr. R. J. Tillyard, B.A., who last year contributed several valuable papers dealing with life-histories, etc., of Australian Dragon-flies; these will be found in Vol. XXX. of the Proceedings quoted above, together with other

faunistic contributions by Messrs. Sloane, Carter, Lea (*Coleoptera*), Hedley (*Conchology*), and Grant (*Crustacea*); while in botanical research there are papers by Messrs. Baker, Cambage, Maiden and Betcher, and Turner. In connection with Vol. XXX., there was issued as a supplement Messrs. Whitelegge and Watts' "Catalogue of the Frondose Mosses of Australia and Tasmania, Part II." Vol. VI., Part 3, of the "Records of the Australian Museum," contains an interesting note on "Two Early Australian Ornithologists," by Mr. A. J. North; "A Synopsis of Australian Acarina" (another neglected group), by Mr. W. J. Rainbow; two papers—one on "Australian and Tasmanian Fishes," and the other, "Studies in Australian Sharks," by Mr. E. R. Waite; and a valuable contribution, "Mollusca from Three Hundred Fathoms off Sydney," by C. Hedley and W. F. Petterd. In the same issue Mr. McCulloch records the occurrence in Australian waters of two species of Crustacea, viz., *Limulus validus*, de Haan, and *Scyllarus sieboldi*, de Haan. The former was recorded from Palmer Island, in the estuary of the Clarence River, N.S.W., and the latter from Lord Howe Island. The original locality of these was Japan.

NOTES AND COMMENTS.

IMMUNITY FROM EFFECTS OF ANT STINGS.—Mr. J. T. Burges records having observed boys at West Kempsey, N.S.W., handle our fierce "Red Bull Dog" or "Soldier Ant," *Myrmecia gulosa*, with apparently little or no pain from their sting. He has seen them with bare feet kick up the nest mounds of this species and then scoop the ants up with bare hands. This suggests these boys have gradually become immune from feeling the pain of the acid injected by the sting by inoculation from repeated stinging by these ants.

COUNTRY MEMBERS.—At a recent meeting of the Club, Mr. L. Harrison reported that some of the country members were a decided acquisition. He had received from one member a complete list of the birds in his district. We trust this will be an incentive to others, as local lists of animals or plants are of value and assistance to specialists.

DREDGING OFF THE COAST.—A scientific expedition, organised and led by Professor H. Haswell, F.R.S., recently dredged some miles off the coast of New South Wales. Rough weather unfortunately militated against the success of the party when endeavouring to explore the greater depths of the ocean floor. The expedition succeeded fairly well in working at 300 fathoms, at which depth they obtained some valuable material. The best and largest collection was made at 80 fathoms, and this included many species new to science. The

vessel used was the Commonwealth steamer *Miner*, which had been lent for the purpose by the Federal Government. The dredging party consisted of Professor Haswell, Dr. Hill, Messrs. Hedley, F.L.S., E. J. Goddard, B.Sc., H. L. Kesteven, and A. R. McCulloch, and the vessel was under the command of Lieut. J. H. A. Lee, R.N.

SCIENTIFIC EXCURSION.—Mr. C. Hedley, F.L.S. recently organised a scientific excursion to Northern Queensland. The party, in addition to the leader, consisted of Mr. T. G. Taylor, B.Sc., B.E., of the Sydney University, Mr. J. Gabriel, of Melbourne, and Mr. A. R. McCulloch, of the Australian Museum. The party travelled by steamer to Cooktown, and there chartered a comfortable schooner of 25 tons to convey them to a point on the Great Barrier Reef. Most of the time was spent in collecting upon the historic reef where Captain Cook, in H.M.S. *Endeavour*, was wrecked in 1770. Dredging was undertaken at every opportunity, and this added considerably to the collections made. Mr. Taylor devoted himself chiefly to studying the geological aspect of the question; Mr. Gabriel obtained some interesting *Polyzoa*; Mr. Hedley collected a number of new and rare *Mollusca*; and Mr. McCulloch a valuable series of *Crustacea*. The collections are now being worked out.

NOTES ON BUTTERFLIES.—Mr. G. A. Waterhouse, B.Sc., records the following information: "In December last, at Pambula, a small butterfly, *Neolucia agricola*, D., W. and H., was observed to be attacked and eaten by a small bird." This is the third instance of the kind noted in the pages of this journal. We shall be glad to publish further records of such observations, and would urge collectors and country friends to carefully note any instances of the kind they may observe. Mr. Waterhouse also records that in January last, *Papilio macleayanus*, Leach, was plentiful on Mt Kosciusko, and that right up on the summit numerous individuals were seen; further, one specimen of *Heteronympha solandri*, Waterh., was taken at the same time at the 5000ft. level of the mountain.

BUGONG MOTH AND LARVÆ.—Throughout August and September of this year swarms of caterpillars have appeared in various districts of New South Wales. These are mainly larvæ of the "Bugong" Moth (*Agrotis infusa*), and are apparently progeny from the huge numbers of these insects which appeared towards the end of 1905 throughout New South Wales, and in Victoria and Queensland. The caterpillars are black, with indications of brownish stripes laterally and dorsally. Like some other Noctuid moth larvæ, these caterpillars are known as "cutworms," from the habit of cutting off the tops of young plants by eating right through the

stem close to the ground. Around Sydney they have been very destructive in vegetable gardens, and at Tamworth they also attacked lucerne. At Hawkesbury Agricultural College, though they swarmed through the fields and orchards, the cereal crops were hardly affected; but they were very destructive in the vegetable plots, many beds having to be entirely replanted. On September 14—Digging to from four to six inches below the soil revealed dozens of full-grown larvæ about to pupate. Three caterpillars thus unearthed I noticed had each a small external parasitic grub (Hymenoptera) attached to the segments close behind the head. These parasitic grubs (about $\frac{1}{8}$ in. in length) fed on the juices of their living host, and grew with great rapidity in length and bulk (about $\frac{5}{16}$ in. to $\frac{3}{8}$ in. in length), and there was a corresponding decided decrease in the bulk of the caterpillar hosts. Eight days later (20-9-'06) one had become fully grown, and spun black silk over the loose soil; by the 23rd it had formed a neat cylindrical cocoon of black silk. Another individual had also by this time spun a little silk. The cocoon suggests a Thynnid or Scoliid wasp, but until the adult appears the insect cannot be identified.—W. GURNEY.

NEW BOOK.—Just prior to going to press the Club received as an addition to its library, "Fishes of Australia," by Mr. D. G. Stead, Naturalist to the Fisheries Board,—one of our members. The work is a valuable addition to contemporary scientific literature, but is written in such a manner, that whilst being useful to the naturalist advanced in his study, it is also easily understandable by the non-scientific, yet nevertheless intelligent, reader. In preparing the work the author has aimed at accuracy of description combined with lucidity and simplicity of diction; moreover, it is admirably illustrated. With such a book as this at his hand, the reader interested in the study of our Fish fauna, has indeed a valuable guide. This is, we venture to hope, the first of a series of useful books—indeed, sadly needed—dealing popularly with Australian biological science, and the non-existence of which has long been a reproach. The work is published by Wm. Brooks & Co., of Sydney, and from a printer's point of view, is a credit both to the firm and the mechanical staff.

MIGRATION OF SWALLOWS.—A letter received August, 1906, from Mr. E. A. Elliott, Hon. Secretary of the Tasmanian Field Naturalists' Club, who has been collecting dates of arrival of swallows (*Hirundo neoxena*, Gould) in Tasmania, asks for any data members of the New South Wales Naturalists' Club can supply on the times of departure southward of flights of swallows on the mainland. Notes dealing with this subject can be forwarded to Mr. Elliott through our Hon. Secretary.

THE
Australian Naturalist.

VOL. 1.

JANUARY, 1907.

PART 5.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday evening, October 4, 1906, the President, Mr. G. A. Waterhouse, B.E., B.Sc., F.E.S., in the chair.

ELECTIONS TO MEMBERSHIP.—Messrs. F. Esmond, Enmore; T. G. Taylor, B.Sc., The University, Sydney; H. Garnsey, Enmore; Rudolf Tegel, Woollahra; and Rev. P. Norman, Scone.

PAPER.—Mr. J. J. Fletcher, M.A., B.Sc., read a paper entitled "How the Emu came by its Vernacular Name."

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday evening, November 1, 1906, Mr. W. W. Froggatt, F.L.S., in the chair.

ELECTIONS TO MEMBERSHIP.—Miss F. Newton, Mosman; Miss N. Tynan, Newtown; Miss M. Miller, Blackfriar's Practice School; Messrs. J. T. Milne, Mosman; J. H. Keane, Marrickville; A. S. Le Souef, Director, Zoological Gardens; and Edgar H. Booth, Chatswood.

ADDRESS.—Mr. T. G. Taylor, B.Sc., gave a short address on some geological features of Ourimbah and adjacent districts; his remarks were illustrated by lantern views.

LECTURE.—Mr. Chas. Hedley, F.L.S., delivered a lecture entitled "A Week on a Coral Island," which he illustrated by a series of fine lantern views. This was an account of a recent collecting trip undertaken by the lecturer and several friends to the Great Barrier Reef.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday evening, December 6, 1906. The President, Mr. G. A. Waterhouse, B.E., B.Sc., F.E.S., in the chair.

LECTURE.—Mr. C. A. Sussmilch, F.G.S., delivered a lecture on "Fossil Fish," in which he dealt with their structure and their relationship to present day fish on one hand and to the reptiles on the other, illustrating his remarks by means of diagrams.

Messrs. Froggatt, Coles and Gurney reported the success of the Club's camping-out at Ourimbah, on the 10th, 11th and 12th of November last, and gave an outline of the fauna and flora of the district.

HOW THE AUSTRALIAN EMU CAME BY ITS VERNACULAR NAME.

(By J. J. Fletcher, M.A., B.Sc.)

THE term Emu, or Emeu, is said to be derived from a Portuguese word *Ema* or *Emea*, signifying a crane or large bird.* The name was formerly applied to the ostrich-like bird of the island of Ceram, subsequently known as the cassowary†; as well as to the struthious birds of South America, afterwards called South American Ostriches or Rheas.‡ As the Portuguese had no share in the colonisation of Australia, it seems a legitimate question to ask, how it is that a word of Portuguese origin has been for more than a century the current vernacular name of the common struthious bird of Australia? The answer to this question does not seem to be generally known. The most copious bibliography of the literature relating to the Australian emu is perhaps that to be found in the last volume (XXVII.) of the British Museum Catalogue of Birds (1895, p. 586). Nevertheless, this bibliography omits any reference to the earliest work in which the name is applied to the Australian bird.

The facts are simple. On 26th January, 1788, Governor Phillip saw his fleet safely at anchor in Sydney Cove. On 2nd March following, the Governor made an exploring visit to Broken Bay, returning on the 9th. During his absence the first emu of which we have any definite account, was killed within a distance of two miles of the settlement. As the first milestone is still extant, at the corner of George and Liverpool Streets, the scene of the tragedy may very well have been within a radius of about half a mile of the site of the now dismantled Redfern Railway Station. Several of the officers beside the Governor were keeping journals, and one or two of them were interested in natural history. The capture of the first emu, therefore, excited some considerable interest, and afforded a pleasant break in the monotony which prevailed just at that particular period in colonial history.

The earliest accounts of the Australian Emu are to be found in the first two books dealing with the history of the settlement at Port Jackson, to be published. These were Captain Watkin Tench's "Narrative of the Expedition to Botany Bay," etc., a thin octavo of 146 pp., without illustrations, and the more elaborate and illustrated quarto, entitled, "The Voyage of Governor Phillip to Botany Bay." According to the dates given on the title-pages of the first editions, both works were published in the same year, 1789; but it seems now impossible to determine which of them appeared first. The preface of

*Prof. Newton's article "Emeu," *Encyclop. Brit.*, 9th Edit., Vol viii., p. 171.

†Any of the older ornithological works, such as Lay & Willoughby's "Ornithologia," 1676, p. 105.

‡Charles Darwin's "Journal of Researches," &c., 1860, p. 93, (quoting Dobrizhoffer, 1749, who, even at this early period, knew of more than one species).

Tench's work is dated from Sydney Cove, "July 10th, 1788," and unless official or other influence was intentionally exercised to delay its publication, it might have been the first in the field. "Phillip's Voyage" was a compilation for which Stockdale, the Government Printer, was mainly responsible. This must have appeared very late in the year, as the plates are dated, and some of them were published as late as 20th October, 1789 (including the plate of the New Holland Cassowary).

Tench's "Narrative" is of special interest, because the MS. had finally passed out of the author's hands before British or foreign naturalists had had any opportunity of expressing their views upon the drawings or specimens of Australian animals, which were sent home as opportunity offered; and, therefore, the opinions about Australian animals expressed by Captain Tench were arrived at without his being influenced in any way by the determinations of experts in Europe. His account of the emu is given in the following extract:—

"To the naturalist this country holds out many invitations. Birds, though not remarkably numerous, are in great variety, and of the most exquisite beauty of plumage, among which are the cockatoo, lowry, and parroquet: but the bird which principally claims attention is a species of ostrich, approaching nearer to the emu of South America than any other we know of. One of them was shot, at a considerable distance, with a single ball, by a convict employed for that purpose by the Governor; its weight, when complete, was seventy pounds, and its length from the end of the toe to the tip of the beak, seven feet two inches, though there was reason to believe it had not attained its full growth. On dissection many anatomical singularities were observed: the gall-bladder was remarkably large, the liver not bigger than that of a barn-door fowl, and after the strictest search no gizzard could be found; the legs, which were of a vast length, were covered with thick, strong scales, plainly indicating the animal to be formed for living amidst deserts; and the foot differed from an ostrich's by forming a triangle, instead of being cloven. Goldsmith, whose account of the emu is the only one I can refer to, says 'that it is covered from the back and rump with long feathers, which fall backward and cover the anus; these feathers are grey on the back and white on the belly.' The wings are so small as hardly to deserve the name, and are unfurnished with those beautiful ornaments which adorn the wings of the ostrich: all the feathers are extremely coarse, but the construction of them deserves notice—they grow in pairs from a single shaft, a singularity which the author I have quoted has omitted to remark. It may be presumed that these birds are not very scarce, as several have been seen, some of them immensely large, but they are so wild as to make shooting them a matter of great difficulty. Though incapable of flying, they run with such

swiftness, that our fleetest greyhounds are left far behind in every attempt to catch them. The flesh was eaten and tasted like beef.

"Besides the emu, many birds of prodigious size have been seen, which promise to increase the number of those described by naturalists, whenever we shall be fortunate to obtain them" (p. 142).

From this account we learn a fact of fundamental importance not to be gleaned so satisfactorily from any other source—that one of the officers or members of the First Fleet, possibly Captain Tench himself, brought with him from England, a copy of Oliver Goldsmith's "Animated Nature," published in 1774. This is the peg on which the whole story hangs.

In "The Animated Nature" Goldsmith described at some length the three species of ostrich-like birds then known to naturalists. But it is important to note that he followed the example of Buffon in not using the binomial names which Linnæus had already applied to them, namely, *Struthio camelus*, *S. casuarius*, and *S. rheu*. Accordingly, Goldsmith treats of them, under their vernacular names only, as the Ostrich, the Emu, "which many call the American Ostrich," and the Cassowary.

Other points to be noted are, that Captain Tench and his colleagues, with the aid of "The Animated Nature," seem to have held a sort of scientific inquest upon the new bird; that the problem which they endeavoured to solve was, whether it was an ostrich, an emu (South American Ostrich), or a cassowary, in the general sense in which those terms were used by Goldsmith; and that their verdict was that, though it was not the Emu or South American Ostrich, it was to be regarded as an Emu. "Besides the emu," Tench says, obviously meaning the New Holland or New South Wales Emu, though evidently he thought it superfluous to mention this. Tench's account leaves us to draw our own conclusions upon two important matters, namely, exactly how the verdict was arrived at, and whether it was in all respects a unanimous one. Satisfactory answers to these questions are, to some extent, conjectural; but there is no great difficulty in the way of settling the more important points, for in arriving at their verdict, Tench and his colleagues were influenced by several obvious considerations.

In the first place, the order in which Goldsmith places the birds counted for something. It will be noticed that Tench makes no mention of the characters which differentiate the New Holland Emu from the Cassowary. Either in following Goldsmith's order he did not get as far as the Cassowary; or, what perhaps is more likely, the absence of the casque, of wattles, and of wing-quills, the equality in length of the claws, and the much greater length of the alimentary canal may, not unreasonably, have been deemed sufficient to outweigh the presence of the aftershaft in both birds, and so to put the Cassowary out of

court altogether. However this may be, in proceeding to deal with the problem which confronted them, the first step taken was to eliminate the two-toed ostrich of Africa. So far there was no trouble, but it must be conceded that the task of determining the amount of, and striking a balance between, the affinities of the Australian bird, on the one hand with the South American emu, on the other with the cassowary, apparently received rather one-sided consideration from Captain Tench.

In the second place undue importance was attached to the supposed height of the Australian bird (7 feet 2 inches from the end of the toe to the tip of the beak). That is to say, those who measured this bird had not seen it alive, and did not realise that the long axis of the body was not vertical but almost horizontal. However, by putting the bird in an unnatural position, the height was ascertained to be 7 feet 2 inches; and then on comparing this with the measurements given by Goldsmith (7 feet, 6 feet, and $5\frac{1}{2}$ feet), strong argument seemed to be furnished for an alliance with the emu. The Australian bird on this scale was even bigger than the ostrich.*

In the third place it was correctly noted that the wings of the Australian bird were small and devoid of wing-plumes. It was recognised also that the feathers had an aftershaft; but as Goldsmith expressly says that very little was known about the South American emu, and that he had had difficulty in ascertaining its special peculiarities, Captain Tench seems to have felt justified in concluding that the feathers of the latter also possessed an aftershaft, but that Goldsmith had omitted to mention the fact.

As to whether the verdict was in all respects a unanimous conclusion, we cannot now definitely decide, because, with two unimportant exceptions, the opinions of Tench's colleagues were published some time after "*Phillip's Voyage*," and the writers felt it more or less incumbent upon them to pay some deference to the views of Dr. Latham, as expressed in the "*Voyage*;" or, as in the case of Dr. White's account, a London editor intervened. But there seems to have been perfect agreement on one point, namely, that the Australian bird was the representative of a new species. Beside Tench's account, the only other statements about the bird which finally passed beyond the writers' control before the publication of "*Phillip's Voyage*," known to me—the exceptions referred to above—are furnished by Governor Phillip's first despatch to Lord Sydney, and by a letter from Captain Hill to Mr. Wathen. The former states that . . . "a bird as large as the ostrich was killed while I was at Broken Bay. It differs both from the ostrich and the emu."† The latter says—"The plumage of the birds is uncommonly beautiful, some of which (as I am informed) are a new species, or

*See the curious figure given by Collins. Vol. ii., p. 307.

†Historical Records, Vol. i., Part 2, p. 135, (under date 15th May, 1788).

rather nondescripts, such as the emu, having no wings but they run very fast."§

On the other point, namely, whether the Australian struthious bird was to be classed in a general way as an emu or a cassowary, there would appear not to have been perfect unanimity, if we may take certain details in some of the later accounts at their face value. But in my opinion, and for reasons which will appear when we come to consider these accounts seriatim, we are hardly justified in so doing. Moreover, as will be evident when we come to deal with Judge-Advocate Collins' contribution to the subject, which is of special interest in this connection, the name, New Holland Cassowary, never had any serious chance of supplanting the more familiar name which first gained currency—at least not in the Colony.

The skin of the emu examined by Tench and his friends was sent home to England in spirits, and presented to Sir Joseph Banks. It was afterwards mounted, and a description of it, together with a figure, was published in "Phillip's Voyage." Dr. Latham is said to have been responsible for the former. At this time, this writer did not use the binomial system; and the name he bestowed on the bird was that of "The New Holland Cassowary." No comparisons are instituted with the ostrich or rhea, and no reasons are given for the decision that the bird was a cassowary. This is taken for granted; and then about one-half of the description is devoted to a consideration of the important differences between the New Holland and the Common Cassowary.

The next account of the Australian ostrich-like bird, in chronological order, is that to be found in Surgeon White's "Journal of a Voyage to New South Wales," a fine illustrated quarto, published in 1790, the preface being dated November 18th, 1788. This is a lengthy description of the bird described by Tench and Latham, the only one captured up to the date of the despatch of the manuscript to England; and it comprises more anatomical details than are given by any of the author's colleagues. Two sentences of it are all that need occupy our attention, as the name emu is not mentioned at all. "30th February, 1788. A New Holland cassowary was brought into camp. This bird stands seven feet high, measuring from the ground to the upper part of the head, and, in every respect, is much larger than the *common Cassowary* of all authors, and differs so much therefrom, in its form, as to clearly prove it a new species" (p. 129). The adoption of Latham's name in the passage quoted, the omission of all mention of the published views of Tench, and especially the expressions, the "common Cassowary" (used also by Latham, but not by Goldsmith), and of "all authors" (Goldsmith being the only author that White

§Op. cit., p. 371, (under date 26th July, 1770). At this time apparently, copies of "Phillip's Voyage" had not been received in Sydney; or, at least, Captain Hill had not seen one.

could possibly consult), clearly betray the London editor of the ornithological portion of the *Journal* (Dr. Shaw), whose identity is revealed in the preface to the work. It is to be regretted, therefore, that we do not certainly know whether Surgeon White favoured, or was opposed to the view advocated by his colleague.

In his second book, entitled "A Complete Account of the Settlement at Port Jackson, &c.," a quarto without illustrations, published in 1793, and under the heading of "On its Animal Productions," Captain Tench gives a general account of the emu. As this is too lengthy to quote in full, a sentence or two will suffice. He says: "At the head of the birds the cassowary, or emu, stands conspicuous. . . . The largest cassowary ever killed in the settlement weighed ninety-four pounds." In addition, the bird is spoken of as the cassowary four times (pp. 173-175).

The author's apparent preference for the name cassowary in this book is perhaps to be explained by his absence from New South Wales since December, 1791, and a desire to defer to local (English) authority.

In the same year, 1793, Captain John Hunter's "An Historical Journal of the Transactions at Port Jackson," made its appearance. The following extract from this work is of importance:—"There are a great variety of birds in this country . . . There have been several large birds seen since we arrived in this port; they were supposed, by those who first saw them, to be the ostrich, as they could not fly when pursued, but ran exceedingly fast; so much so that a very strong and fleet greyhound could not come near them: one was shot, which gave us an opportunity of a more close examination. Some were of opinion that it was the emew, which I think is particularly described by Dr. Goldsmith, from Linneus; others imagined it to be the cassowary, but it far exceeds that bird in size; it was, when standing, seven feet two inches from its feet to the upper part of its head; the only difference which I could perceive between this bird and the ostrich was in its bill, which appeared to me to be narrower at the point, and it has three toes, which I am told is not the case with the ostrich: it has one characteristic by which it may be known, and which we thought very extraordinary; this is, that two distinct feathers grow out from every quill. The flesh of this bird, &c." (p. 69.)

This account is noteworthy for several reasons. Captain Hunter is the only contributor to the "Sydney Chronicles" who spells the word, "emew"; possibly this may have been a typographical error which passed unnoticed. He is also the only author, besides Tench, who makes any reference to Goldsmith; but evidently this reference was based on hearsay. Hunter could hardly have consulted "The Animated Nature,"

or he would not have supposed that Goldsmith had borrowed the description of the ostrich from "Linneus"; nor would he have needed to be told that the ostrich had only two toes on each foot. On the other hand, if the entry in the Journal was written as published, and not simply amplified for subsequent publication, then the expressions "some were of opinion that it was the emew . . . others imagined it to be the cassowary" are of importance, because they show that there was not complete agreement among those who examined the first emu in the flesh, in which case it would probably be Captain Tench and Dr. White who were not in accord. But on this point the evidence seems not quite conclusive, otherwise one would expect to find some evidence that the name cassowary had some prospect of gaining currency, even apart from any possible deference to Dr. Latham's authority; and this is not forthcoming in either case.

Hunter's "Journal" also includes Captain P. G. King's "Journal," the greater portion of which relates to Norfolk Island. On his return to Port Jackson after two years' absence, Captain King evidently found the word emu in current use, for he employs it four times (p. 413) without any allusion to the cassowary. Hunter's "Journal" also contains three short references to the bird—"A number of emu's had been seen lately" (Sept. 1791) . . . "An old emu was seen near Prospect Hill with some young ones . . . but it was a considerable time since an emu had been shot." (p. 547.)

The remaining work comprised in the "Sydney Chronicles" is the work of Lieutenant-Colonel Collins, Judge-Advocate, entitled, "An Account of the English Colony in New South Wales," of which Vol. I. was published in 1798, and Vol. II. in 1802. For our present purpose, this work is most important. In Vol. I., which covers the period of colonial history ending September, 1796, there are five references to the emu, and the term cassowary is used only once:—

"March, 1788. The curiosity of the camp was excited and gratified for a day or two by the sight of an emu, which was shot by the governor's gamekiller. It was remarkable, by every stem having two feathers proceeding from it. Its height was 7 feet 2 inches, and the flesh was very well flavoured" (p. 24).

"February, 1789. At Rose Hill . . . two Emus, or Cassowaries, who must have been feeding in the neighbourhood, ran through the little camp" (p. 57).

"March, 1789. Towards the latter end of the month, two of the birds distinguished in the colony by the name of Emus were brought in by some of the people employed to shoot for the officers. The weight of each was seventy pounds" (p. 64).

"September, 1789. At Rose Hill, where the corn promised well, an Emu had been killed, which stood seven feet high, was

a female, and, when opened, was found to contain exactly fifty eggs" (p. 82).

"August, 1790. An excursion into the country had been taken this month by Captain Tench and some other officers . . . They saw a flock of emu's twelve in number" (p. 131).

In Vol. II., which carries on the narrative of events up to October, 1800, there are three allusions to, and an extraordinary coloured portrait of the emu, but the term cassowary is not mentioned. During the visit of Flinders and Bass to the Derwent (January, 1799), it is said that "once they heard the tread of an emu" (p. 189); and during the visit of Flinders to Glass House Bay that "the emu was not seen, although its voice had been so often heard as to induce him to suppose that bird must be numerous" (p. 248). Still more interesting is the following extract:—"On board of the Buffalo [which sailed for England on 21st October, 1800] were two of the birds denominated by Dampier black-swans, and three of those which in New South Wales were styled emus . . . The other birds [the emus] were given . . . to Sir Joseph Banks . . . These birds have been pronounced by Sir Joseph Banks, of whose judgment none can entertain a doubt, to come nearer to what is known of the American ostrich than to either the emu of India or the ostrich of Africa" (p. 307). The portrait is entitled "The Emu of New South Wales," and this appellation appears again in the list of the plates.

Reviewing the evidence afforded by the important work of Collins, it will be seen that the term cassowary is used only once (in the entry for February, 1789, a date much in advance of the publication of Latham's description). Its use may therefore have been a later interpolation in deference to the English authority; or if the entry was written in its published form, a lack of unanimity among his colleagues is indicated. Be this as it may, clear evidence is afforded that, by the end of the eighteenth century, the name emu had become well established among the colonists, and had no rival.

In conclusion, the evidence summarised above shows that Captain Tench was responsible for the publication of the vernacular name of the Australian emu, if not for the choice thereof; that the possession of a copy of Goldsmith's "Animated Nature" led up to it; and that the earliest use of the name is to be found in Tench's "Narrative." It is also shown that the name was not given in a haphazard way, but that it was the outcome of a genuine attempt to name the bird correctly, in so far as the knowledge of zoology of those concerned, and the scanty literature at their disposal enabled them to do so. If a satisfactory, short, and euphonious aboriginal name had offered itself, something which would have hit the popular taste as readily as did the name kangaroo, very probably Tench and his colleagues would have ventured to adopt

it. The native names available, "Maracry," "Marryang" or "Maroang," did not however readily lend themselves to this. Contemporary evidence also shows that in New South Wales the name emu never ran any serious risk of being displaced by that of cassowary; and, also, that the name was adopted as readily as words like kangaroo or wallaby by those who, from time to time, were concerned in establishing other Australian settlements.

ENTOMOLOGICAL BEACH-COMBING.

(By H. J. Carter, B.A., F.E.S.)

If anyone will visit Bondi, Sandringham, or Manly on one of those days in November or December when a strong southerly has succeeded a scorching wind, he will probably find the high-water mark line strewn amidst other flotsam with innumerable insects of various orders, families and species. Every coleopterist should eagerly avail himself of such opportunities for collecting species that he may not easily meet with elsewhere. The writer of this has thus collected Carabidæ, Scarabidæ, Buprestidæ, Cerambycidæ and other families in large numbers, and recalls to memory *Calosoma schayeri* (plentifully at Bondi), *Diadoxus erythrus*, *Cnemoplites* sp., and some of the larger fresh water beetles. These last apparently take to the air in hot weather, somewhat as we, by a converse process, take to water. These adventitious visitors are not, however, denizens of the beach, but have been blown perhaps from some distance inland out to sea by westerly winds, only to be buffeted back again by the southerly burster, when they are finally caught by breakers and drowned or stupefied by a more or less continued course of surf bathing.

A far more interesting and informing kind of collecting is the search for true beach dwellers, of which there is an extraordinary large and varied population on our coast. This is the more interesting since its pursuit can be followed at any time of the year, and with increasing success as the collector learns more of the haunts, habits and periods of incubation of the many species. Numbers of these thus turned up by the writer have proved to be undescribed species, while many are doubtfully identified, or still under observation, as is the case with a large number of the "small fry" of our commonest insects. Of the larger forms *Cicendela ypsilon*, Dej., is one of the most interesting. This beautiful marble white (it is notable that many of our sand beetles are thus coloured—an obvious protective character) insect evidently carries on his previous existence near the beach, but so far as I am aware its larva and pupa are unknown. The imago is found commonly on all our sandy beaches, from November to February, basking on the

wet sand like a large fly. As one approaches it takes a rapid short flight, and if you are very energetic, and the weather is not too hot, you will have some excellent sport spiced by disappointment in just missing it after a succession of these flights, which, if actively enough followed up, become shorter. If, however, you are like Falstaff, "fat and scant of breath," and there is a hot wind blowing and the sun is high, and you really want to catch some, you may add guile to the "frontal attack." Personally I have found a handful of wet sand a useful aid, which, well aimed, seems to cause a momentary indecision on the part of *C. ypsilon*, during which your successful grab may happen. An ordinary butterfly net would make the capture easy enough, but I have caught many without this help. They have a provoking habit of making for the steep sand hills that overhang most of our beaches, where the clogging effects of loose sand are added to swell the foot pounds of gravitation. On the whole, therefore, the capture of a dozen specimens will have reduced the collector to the condition of Mr Mantilini, as a "demnition moist unpleasant body." Resting for a while on a tussock of coast grass, and slowly scraping the sand away so as to lay the roots bare, many small beetles will be brought to light, of which the following are examples:—*Sobas australis*, Hope, a round, convex, opaque, brown Heteromorous beetle, and very common. *Scymena variabilis*, Pasc., smaller than and more strongly striated than *Sobas*, and varying in colour from black to light brown. This is often found under seaweed. *Phycosecis litoralis*, Pasc., a very small insect covered with fine, whitish scales, which are easily brushed off, so that old specimens appear brown. This species has a very wide distribution, and was originally described from West Australia. I cannot distinguish any difference between the Western forms and those from our own beaches, where it is common, though hitherto unrecorded. *Trachyscelis niger*, Car., a minute, round, shining Tenebroionid, that often escapes notice by shamming death, when it might well pass for a seed or small pebble. This genus has also been alone described from West Australia until lately. *T. niger* can be found at any time of the year, and has been taken by me from Stanwell Park to Terrigal in quantities. *Hyocis subparallela*, Champ., and *H. occidentalis*, Blackb., both occur more sparingly in the sand. The latter is doubtfully identified, though it must be very close to the West Australian insect. It also has the whitish protective colouring, while *subparallela* is black or dark brown. Near the steep banks where the sea sand meets the coastal vegetation other forms may be brought to light. Thus *Saragus emarginatus*, Guér., is commonly met with, and can be taken by the same process of pulling up plants and allowing the sand to run down, when our globula brown *Saragus* rolls down in the typically inert

manner of other sand beetles. A larger Dynastid is here also found, apparently performing *all* the functions of its existence under ground. This is *Pimelopus sydneyanus*, Blackb., whose conjugal domesticity I have disturbed at La Perouse. I have also discovered in the same place two minute Scarabs apparently of the genus *Phycodius*. Should there be anything in the nature of carrion found on the sands in the Botany District, *Onthophagus carteri*, Blackb., *Trox tricolor*, Blackb., and *Hypocaccus sinæ*, Mars., are pretty sure to be present, the last a coppery member of the Histeridæ. Several Anthicidæ can be also *unsanded*; especially those belonging to the curiously armoured *Mecynotarsus*, whose tractile head is protected by an elongated anterior process of the prothorax. Of these there are probably two or three species, or else great variations of a variable species, *ziczac*, King, though this was described originally from S.A. Its name is significant of a black ziczac pattern on the whitish ground of the elytra.

Under rolling seaweed large numbers of Staphylinidæ occur, of which the largest is *Cafius areolatus*, Fvl., and commonest *C. sabulosus*, Fvl.; others are *C. australis*, Redt., *C. littoralis*, Fvl., *C. catenatus*, Fvl., *C. velutinus*, Fvl., and a number of more minute genera and species. Amongst the Curculionidæ are several species of the genus *Mandalotus*, undetermined (of which one ornate insect has two white spots on each elytron), found in the sand, whilst *Aphela algarum*, Pasc., and *A. helopoides*, Pasc., occur under seaweed. There is also a small opaque, black Elater that I have taken commonly at the roots of plants at La Perouse, which is at present unidentified and which I have not seen elsewhere, while the pretty little *Horistonotus bicolor*, Rainb., is not infrequent in the same position. Judging from the number of larvæ found it is probable that these sand hills are the breeding or incubating grounds of a large number of Coleoptera and other orders, e.g., the ant lion (*Myrmeleon*). A considerable number of small Carabidæ can be found under sea weed during the summer months belonging to various genera, while the semi-amphibious *Cillenum mastersi*, Sl., is found under stones in Middle Harbour and other parts of Port Jackson.

It will thus be seen that an interesting hour can always be spent in a naturalist's "beach-combing," and much yet remains to be done in the elucidation of life histories, and in the determination of the species of the sandgropers of this as of other coastal districts of Australia.

HINTS ON COLLECTING ARANEIDÆ.

(By the Editor.)

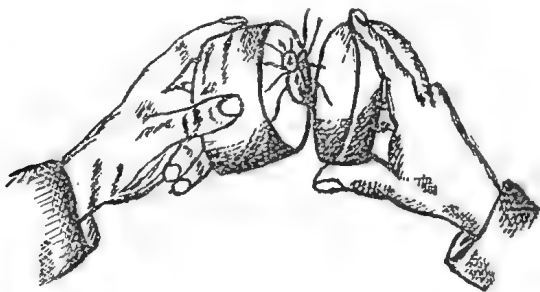
FROM time to time friends are good enough to forward me specimens of Araneidæ, and as many of them have expressed a desire for some information as to how to collect, preserve and

transmit them, the following suggestions are herewith made. My desire to help, however, has a wider reason than this. Now that *nature study* bulks so largely in our public schools, and that many of the latter are forming collections or miniature museums, it is obvious that teachers and pupils would take a greater interest in collecting if they had some little knowledge to guide them: What to do, and where to look.

In the first place then, spiders may be sought for in every conceivable position—on the ground, under logs, stones, and *debris*, in crevices and fissures of rocks, amongst herbage, upon plants, shrubs and trees, under bark, in dark and light situations, amidst refuse on the sea-shore, among rocks, between tide-marks, and even swimming in or skimming over salt-water rock-pools, and upon the surface of stagnant waters; the webs of some species are spread horizontally over running streams and creeks. I say “horizontally” advisedly, because most webs are more or less perpendicular. Indeed, it would be hard to say where spiders may not be found. In making a collection, it is of importance that, where possible, specimens of architecture should be collected as well as the architect itself, and also that notes be made upon their surroundings, together with name of locality and date.

With a little practice spiders may be easily collected. Let the collector provide himself with a conveniently-sized bottle, having a large mouth and containing some spirit, some chip or glass-topped pill-boxes of assorted sizes, a piece of card, a pair of fine-pointed forceps, a camel-hair brush, a net, and a lead pencil. The bottle should be attached to the waist by a piece of string, so as to allow the hands to remain free, and the cork should be large enough to allow of its being tied to the neck of the bottle. This precaution will prevent the cork being mislaid, and so avoid not only vexation, but waste of time in searching for it when the collector should be busy hunting for specimens. Always take the bottle when collecting, but do not be a slave to it by placing everything obtained therein. For instance, when a spider is discovered that has a particularly interesting web, one of the boxes should be used, and a brief note written on the bottom. By abbreviating words, a great deal of useful information may be crammed into a very small space. Thus, for instance, “Irreg. w., tub. ret., coc. susp.” might be neatly written, and would mean “Irregular web, tubular retreat, cocoon suspended;” “U. bark, coc. attach. tree” would read, “Under bark, cocoon attached to trunk of tree;” “Orb. hor.” or “Orb. perp.” would indicate that the web was a round, orbicular one, and that it was suspended either horizontally or perpendicularly as the case may be. Other abbreviations will suggest themselves as the necessity for employing them arises. If the spider and cocoon can be placed in one box, well and good, if not, then two should be

used, one for the animal and the other for the cocoon or nest, but care must be taken to put a corresponding number upon each. Do not put two living specimens together in one box: spiders are cannibals. Some spiders may be taken by holding either the spirit bottle or chip box underneath; when this method is adopted, the Arachnid should be gently touched with the finger or a stick, whereupon it will drop into whatever receptacle is held below. Quick-running spiders (and some are very active) may be taken by clapping a chip-box over them, and inserting the card beneath, after which the animal may be finally secured by placing the lid on top of the card, and then deftly withdrawing the latter and adjusting the lid. The spider resting in its web may be easily captured by taking the lid of a chip-box in one hand, and the bottom in the other, and then bringing the two parts together sharply, so as to encompass the animal. Shaking branches into a net or an



Capturing a Spider from the Web.

inverted open umbrella will be found very profitable. The larger specimens may be lifted with the forceps, and the smaller ones by dipping the camel-hair brush in spirit. Sweeping the long herbage will bring to light a lot more. At first, doubtless, many a prize will be lost, but practice and experience will soon remedy that.

When transmitting specimens through the post, be careful to pack firmly and lightly, and write the address upon a tag. If specimens of architecture are sent in company with the spider, the latter should be in spirit, then both may be packed in the one box. Sometimes living specimens, with their nests or cocoons, may be sent through the post. The mere fact of being carried from place to place, even openly, will not disturb the architect, provided the cocoons are conveyed with it.

In making a collection for one's private study, or for a school museum, tubes of assorted sizes should be procured, and these may be obtained from Mr. Coles (one of our members), whose advertisement appears in another part of this journal. Only

one species should be placed in a single tube containing spirit, together with a label bearing name, date, and locality. Fill the tube to the top until the liquid arches, and then force the cork (which should be a sound, well-fitting one) well and tightly in; allow it to dry, and then smear the surface and neck with a solution of gum arabic, after which, for a further precaution, when the gum has become hard, the cork may be coated by dipping it in melted paraffin wax. This will prevent the spirit, which is exceedingly volatile, from evaporating.

NOTES AND COMMENTS.

ARMIDALE BRANCH.—The Hon. Secretary desires us to announce the affiliation of the Armidale Natural History Club with the N.S.W. Naturalists' Club. The Northern club will now be known as the Armidale Branch of the N.S.W. Naturalists' Club. This is a good forward movement, and the reciprocal help by communication and exchange, which will arise between the parent Club and its new branch, should be of great mutual benefit. The affiliation has been arranged to date back from August 1, 1906. The names of the members of the new branch are as follow:—Mr. W. G. Thomas, president; Mr. J. Scholes, vice-president (Minerals); Mrs. L. Ross, vice-president (Insects); Mr. A. E. Hunt, hon. secretary and treasurer (Birds, Insects, Botany, Minerals); Rev. H. S. Buntine, Mrs. W. S. Thomas, Miss E. Scholes, Mrs. A. Mallam (Minerals), Miss Winchcombe, Miss Hobbs, Mr. J. Newbery (Insects), Mr. and Mrs. A. H. Perrott (Birds, Native Weasels, and Minerals).

SWARM OF BEETLES.—On October 24th, 1906, there was a great swarm of Carabid beetles—*Calosoma schayeri*, Erich., both in Sydney and suburbs. In Hyde Park there were thousands of these insects. Hundreds were crushed under foot, while many, as they crawled along the footpaths, were waylaid by ants. Schoolboys passing to and fro collected great numbers; indeed, they seemed scarcely able to pick them up fast enough.

A CLOUD OF MOSQUITOES.—Simultaneously with the above, an enormous cloud of mosquitoes passed over Port Phillip. While the s.s. *Bombala* was lying alongside the wharf at Melbourne, and was being painted, a cloud of mosquitoes closed over the steamer, and for a minute or two darkened the atmosphere, thousands of the insects being caught on the wet green paint. The *Bombala* reached Sydney a day or two afterwards, with the insects still attached to her side, and was visited by many who were curious to see the extraordinary sight.

BUTTERFLIES' WINGS.—Dr. E. P. Ramsay writes as follows : "In North-Eastern Queensland, in the Herbert River District, I have seen bushes and grass on the margins of the scrubs littered with the glittering wings of *Troides euphorion* and *Papilio ulysses* var. *joesa* during the summer and autumn months."

PROSPECTIVE BOOKS.—The current year, 1907, promises to be fairly active, so far as the publication of new books is concerned. Two have been already announced—one by Mr. W. W. Froggatt, F.L.S. (a somewhat comprehensive work), entitled "Australian Insects," the prospectus of which has been issued; the other is by Mr. W. J. Rainbow, F.L.S., F.E.S.,—"A Guide to the Study of Australian Butterflies." This work will contain only those species of which something is known of the life-history. Altogether there will be nearly 300 illustrations of ova, larvæ, pupæ and imagines. The illustrations will be distributed through the text and in plates, some of which are from photographs direct from nature.

EUPLEA CORINNA, MacL.—After a lapse of about ten years, during which only odd specimens have been seen, this species has been very plentiful in Sydney. Specimens were seen on the wing in September, having no doubt reached us from more northern latitudes. The food plant is a climbing plant named *Mandevillea*. The larva is easily recognised by three pairs of long fleshy tentacles towards the head, and a single pair towards the posterior. The pupa is smooth, suspended by the tail, often under a leaf. It is most brilliantly coloured, usually looking like a lump of silver enamel, with faint marks on head and wing cases: more rarely it is a golden enamel. The following experiment was made with a larva, all weights being in milligrammes:—Dec. 18th, 9.30 a.m., wt. larva, 1000; Dec. 19th, 9.30 a.m., wt. larva, 960; food eaten, 810. Larva suspended early morning 20th; cast off larval skin 21st; wt. pupa, 22nd, when quite dry and normal, 750; colour silver enamel. Imago, (a male) emerged 2nd Jan., 1907; wt. one hour after being killed, 300; wt. of empty pupal case, 20. The larva thus ate nearly its own weight in 24 hours. Just after the larval skin was cast off the pupa was almost transparent, the silvery enamel coming gradually. The markings of the imago were discernible two days before emergence.—G. A. W.

MOTH PARASITE.—The external parasite of the Bugong Moth larvæ, mentioned in my note in the last issue of the AUSTRALIAN NATURALIST (Oct., Part IV., p. 47), proves to be a slender-bodied, orange-coloured Ichneumon,—*Ophion* sp? (Fam. Ichneumonidæ). The adult appeared in November.—Wm. B. Gurney.

THE
Australian Naturalist.

VOL. 1.

APRIL, 1907.

PART 6.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday evening, February 7, 1907, the President, Mr. G. A. Waterhouse, B.Sc., F.E.S., in the chair.

ELECTIONS TO MEMBERSHIP.—Miss J. Donnelly and Miss L. Patterson, Dilga, N.S.W.; Miss Crouch, Metropolitan Road, Enmore; Messrs. J. and C. Donnelly, and John Patterson, Dilga, N.S.W.; F. C. Morse, Coonamble; A. G. Fox, Boggabri; Mr. — Grassick, Technical College, Sydney; Hugh Rayson, Stanmore; Dr. E. S. Stokes, Water and Sewerage Board, Sydney; and T. Harvey Johnston, B.Sc., Sydney University.

ANNOUNCEMENT.—The President announced his intention of offering a prize for junior members, the details of which are announced on another page.

PAPER.—Mr. W. J. Rainbow read a paper entitled "The Ancient Egyptian and his Sacred Beetle," in which he referred to the veneration in which the Sacred Beetle, *Scarabæus sacer*, Linn., was held, and how its figure appears constantly in Egyptian literature and sculpture, and the use to which it was applied as a design for seals, etc.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday evening, March 7, 1907, Mr. Chas. Hedley, F.L.S., in the chair.

ELECTIONS TO MEMBERSHIP.—Messrs. W. Cook, Annandale; A. L. Oschatz, Darlinghurst; C. J. Baur, North Sydney; A. J. Ralph, Bowning; D. Mitchell, Mosman; S. Alexander, Bond Street, Sydney; and A. R. McCulloch, Australian Museum.

ADDRESSES.—Addresses, illustrated by lantern slides, were delivered by Messrs. E. J. Goddard, B.Sc., and H. I. Jensen, B.Sc. The first of these was entitled "Notes on a Collecting Trip in Fiji," and the second "The Recent Volcanic Eruptions in Savii (Samoa)." In addition to the lantern, both speakers illustrated their remarks by a series of interesting exhibits.

A COLLECTING TRIP THROUGH FIJI.

(By E. J. Goddard, B.A., B.Sc.)

SOME two years ago it was my good fortune to be asked to accompany Dr. W. G. Woolnough on a scientific expedition to Viti Levu, the main island of the Fiji Group. The object of the expedition was to collect evidence (geological and biological) which might throw light on the origin of Fiji; in other words, to determine whether Fiji was of continental or oceanic origin.

Dr. Woolnough had previously made a trip through the island, and had collected evidences which served to show that the continental origin was the correct one.

In this short account an attempt will be made to give a general idea of the fauna and flora of the island. Before doing so perhaps it would not be out of place to point out some of the salient features in the fauna and flora of any island which would be characteristic of continental and oceanic origins respectively.

Mr. Hedley, F.L.S., of the Australian Museum, has written some very interesting notes on the subject of the Zoogeography of the Mid-Pacific. If an island is of continental origin, one would expect to find among its fauna organisms which had arisen from the same stock as many of those found on the mainland. The variation between these organisms and their kinsmen of the mainland would be dependent chiefly on the period of time which had elapsed since the separation of the island from the mainland. Australia has been so long separated from the other great land masses of the world that it has developed a fauna of its own which is widely different from that of other parts, namely, its peculiar marsupial fauna.

In comparing the fauna and flora of any island with those of another land mass, with a view of considering land connection between them, attention must be restricted to forms incapable of transmigration. In the case of an oceanic island, forms of animal and vegetable life will be those capable of transmigration.

After preliminary preparations in Suva a start was made for the interior. Running along the coast in a small steamer within the reef, the mouth of the Rewa River was reached. We then proceeded through one of the numerous channels of the delta of this river to the main stream. Along the sides of all the channels of the delta was a thick and massive growth of mangrove. Eventually, after a varied experience of Fijian steamer travelling, we reached a town known as Bau Levu. This is at the head of tidal waters. So far we had been passing through alluvial country. Thence we proceeded by native canoes, and, after two days' travelling, reached a native town—Naivucini—situated on the Wai-ni-mala River, which

is the main trunk of the Rewa River. The country around this town consists of soapstone, which is a very fine-grained tuff, and obtains its name from the fact that when saturated with water it closely resembles soap. This soapstone covers a considerable area of Fiji, and one is enabled, by the character of the vegetation, to readily pick out the soapstone areas. Grassy growths flourish on soapstone areas. In the fresh waters of the Wai-ni-mala River at Naivucini some very fine specimens of Crustaceans, *e.g.*, *Palaeomon* lar and *P. hirtimanus*, were obtained. Also at this spot there occurs an anomalous creature—a fresh-water shark. Unfortunately, I was unable to obtain any specimens of the same, but I am informed on good authority that the beast has a real existence, and that there have been a number of fatal cases of shark-bite.

An ascent was made to the top of a mountain known as Nacau, and here were obtained specimens of an enormous millipede—*Spirostreptis fijiensis*—together with a smaller one—*Spirobolus insulanus*. This organism the natives regard with dread, and when capturing it they use a seizing apparatus of abundant banana leaves.

From Naivucini a trip was made overland through reedy and swampy country, which gave way to forest country, and eventually Nabukaluke was reached. From here an ascent was made to the top of Buke Levu. This mountain is a mass of andesite and andesitic agglomerate. Its sides would afford one of the richest of collecting spots for land shells. At Nabukaluke, on the return journey to Naivucini, large specimens of the mussel—*Batissa tenebrosa*—were obtained. It is most interesting to watch the natives diving for these mussels, and note the ease and quietness with which they disappear beneath the water. From Naivucini we proceeded next to Narokorokoyawa—a large town in the centre of Viti Levu. On this journey we passed over country which was of great geological interest. It was in a portion of the area thus traversed that Dr. Woolnough, in his first trip to Viti Levu, met with the granites, schists, quartzites and slates which were of great interest in throwing light on the origin of Fiji. Nearing Narokorokoyawa one passes into the forest country of the island. Here abound among ferns species of *Blechnum*, *Pteris*, *Lygodium*, *Polypodium*, *Asplenium*, *Trichomanes*, *Aspidium*, *Gleichenia*, *Lomaria*, *Allantodia*, *Davallia*, *Lindsæa*, *Lycopodium* and *Selaginella*. The luxuriant growth of such, together with the occurrence of the cocoa-nut and other palms, forcibly impresses on one's mind the fact that he is in the tropics. Palms other than cocoa-nut palms are not abundant in Fiji. The enormous rainfall over this portion of the island helps, by the rapid disintegration of the rocks, to form a rich soil on which the vegetation flourishes. Among the above-mentioned, Pteridophyta, the most graceful, is a

climbing species of *Lygodium*. This plant twines around the stems of trees up to a height of 50 feet. The leaves at the base are entire and sterile, those higher up being partly sterile and partly spore-bearing. In the spore-bearing leaves the margins are produced into a number of digitate sori masses. The fern is known to the natives as the Wa-ka-lu, or "Fern of the Gods." In the neighbourhood of Narokorokoyawa a good collection of fresh-water fishes was obtained. The size of some of these was remarkable, considering that the water is extremely shallow and rapids are very abundant.

Among land forms, the large beetle *Macrotoma heros* was obtained. The giant larvæ of this organism are used by the natives in place of fat. This I learnt on making inquiries after having consumed a fine meal of fried bananas. Spiders are exceedingly abundant, as one soon finds out when spending a night in a cave, an experience which sometimes fell to our lot. The principal species are *Nephila maculata* and *Cyrtophora moluccensis*. Scorpions are not regarded by the natives with the same dread as they fear the large millipedes (*Spirostreptis fijiensis*) mentioned above. The boys will bring one a handful of scorpions with as little fear as if they were carrying a handful of marbles. Among the scorpions are found *Isometrus perfidus* and *Isometrus maculatus*. The millipede (*Spirostreptis fijiensis*) is said to eject a fluid which is extremely harmful to the eyes, and may cause blindness. Fungi and lichens are extremely abundant. Among the fungi one of the most prominent members is the succulent and evil-smelling *Phallus impudicus*. Prominent among the higher plants are numerous species of Hibiscus, the flowers being much in use among the natives for self-adornment. The fibres of the Hibiscus are used in the preparation of their "national" beverage—yaqona, or kava. This material is obtained from the root of *Piper methysticum*, which is found growing in close proximity to the native houses. Unfortunately, in a brief paper of this nature, a catalogue of the members of the Fijian flora would be out of place. Suffice it to say that in arboreous vegetation Fiji has many fine specimens. Although none of the trees attain the dimensions of the mammoth trees of California, nor the gigantic size of some Australian eucalypti, yet they are splendid examples of their respective kinds. The flora of Fiji is essentially tropical. Its general character is Polynesian, with some affinities to the flora of Australia and the Malay Islands. From Narokorokoyawa, as a central camp, numerous excursions were made to different parts of the island. One of the most memorable of these side excursions was the trip across the central plateau. After rising a few thousand feet through a mass of tropical ferns we reached the top of the plateau, and then journeyed for miles through a morass. The surrounding country is composed of andesite. Very few white men have

undertaken the passage across this part of the plateau, and one who has traversed it can then understand the reason. After reaching the western side, we descended a few thousand feet over the soapstone into the valley of the Sigatoka, which is the main river of the western portion of Viti Levu. The characteristic appearance of this country, with its level-bedded tuffs, would enable one, on waking in the morning, to readily see in what part of Viti Levu he really was. At the native town of Namoli specimens of fresh-water fish were obtained, the commonest forms being *Gobius crassilabris*, *Eleotris guentheri* and *Sicydium tenuirum*. After leaving Namoli, and traversing about ten miles of grassy country, we reached Tawaleka, which is situated about two miles from Natuatuacoco, or Fort Carnarvon. Behind Tawaleka is a rise, on top of which occur fossil gastropods and foraminifera. This marks one of the very few fossiliferous inland areas. In making the ascent of this elevation one has to cut his way through a growth of reeds and grasses. There are few species of native reeds and grasses, but the species which do occur cover great areas, being particularly flourishing in spots which were once under cultivation.

Another trip was made to Nadaravatu, in a north-westerly direction. Near this place is Mt. Tamanivi, or Mt. Victoria—a high, basaltic peak. On the top of this peak was found a myrtle, which is said to be the sole member of its kind now present in the island. In the forest in this region are abundant examples of the “dakua,” or *Dammara vitiensis*, which in places reaches a height of 100 feet. The Fijians are fond of setting a light to the pitch of this tree, which malpractice constitutes one of the few causes of imprisonment.

Among other trees is the Polynesian chestnut (*Inocarpus edulis*). This interesting tree is rather larger than an average-sized English elm, frequently growing to a height of 80 feet, and in the outline of its head and habit it is not unlike that tree. Its trunk is a curiosity. It is deeply fluted, or, rather buttressed, all round, and a section of it would not be unlike a cart wheel, minus the felloes; the buttresses, like the spokes, spring from a central part resembling the nave. The diameter between the extremities will range up to 20 feet; that of the central part (nave) perhaps a foot. Also occurring among members of the botanical kingdom are large fig trees (*Ficus*), known as baka.

Among parasites are three species of loranths and two curious species of apophyllous viscums. The loranths are very common in Fiji, and are found on nearly every “ivi” tree (*Inocarpus edulis*). Orchids are not abundant, the principal ones being species of *Calanthe* and *Dendrobium*. In the neighbourhood of Suva itself were seen specimens of the interesting climbing fish (*Periophthalmus*).

NOTES ON THE BIRDS OF FIJI AND OTHER ISLANDS.

(By Launcelot Harrison.)

At the March meeting of the New South Wales Naturalists' Club Mr. E. J. Goddard outlined a collecting trip in Fiji, which had for its purpose the gathering of material to aid in proving the continental origin of this group of islands. Mr. Goddard's remarks on his results showed us that a fairly close relationship existed between the Fijian fauna and that of Australia; but as he made no mention of the avifauna, a few words on the bird relationships may prove interesting.

Of the six families of birds confined to the Australian region, two are represented in Fiji—the honey-eaters (*Meliphagidae*) and the cuckoo-shrikes (*Campophagidae*). The former family is typically Australian—only one species, *Ptilotis limbata*, crosses Wallace's Line—and it is interesting to find in Fiji members of two very common Australian genera, *Ptilotis* and *Myzomela*, of which we have representatives about Sydney, as well as some silver-eyes (*Zosterops*), dubious members of the honey-eater family. Coming further south, it is more interesting still to find two large and distinct silver-eyes upon Norfolk Island, and three highly-specialised honey-eaters, the parson-bird, bell-bird, and recently-extinct stitch-bird, in New Zealand.

In the second family, a lalage is found in Fiji, very like the familiar "peewee-lark" (*L. tricolor*) of the Sydney small boy, while a close relation also appears in the Norfolk Island "sparrow" (*Symmorphus*), but no member of the family is found in New Zealand. The suggested connection of Fiji with Norfolk Island is, however, a point I would wish to emphasise, as the connection of the latter island with New Zealand to the south, and with New Caledonia and New Guinea to the north can be fairly well established on other evidence. Two other Fijian birds showing a close relation to Australia are a wood-swallow (*Artamus*) and a leaden fly-catcher (*Myiagra*), while the wandering kingfisher is common to New Zealand, Norfolk Island and Fiji, and is closely allied to the sacred kingfisher of Australia. The most important remaining birds are parrots and fruit-pigeons of good Australian lineage. It will thus be seen that the avifauna of Fiji, like that of all the islands to the north and north-west, is typically Australian.

Coming south, however, the enquirer is faced by a number of isolated species and groups, which complicate the question of distribution considerably. In New Caledonia the first stumbling-block is met with in the kagu, which many of our members will remember to have seen on the occasion of our visit to Mr. Finckh's aquarium. This bittern-like bird is really a specialised rail, and its only relative in a world of birds is the sun-bittern of the north of South America. The problem

of bringing these two birds together, or attempting to explain how they were forced apart, is beyond me, but the fact that New Zealand still possesses a large number of very distinct ralline birds, including the famous *Notornis*—first described as a fossil, and afterwards found alive—and the wood-hens, one of which reaches Norfolk Island, may indicate that the ancestors of the kagu were also found in New Zealand. Some of the New Zealand cormorants show affinity to certain South American species. On Norfolk and Lord Howe Islands two birds are found which are, to all intents and purposes, first cousins to the English blackbird, though no members of the genus (*Merula*) are found either in Australia or New Zealand. A thickhead, robin, and shining starling are also found on Norfolk Island to connect it with Australia, as well as the silver-eyes, while the wood-hen and wandering kingfisher, and, more particularly, a parrot (*Nestor*), link the island to New Zealand.

The New Zealand birds are, in part, closely allied to those of Australia, and, in part, the remnant of a very ancient bird fauna. This latter is so interesting and so distinct that it is questionable whether it does not justify the colony ranking as a separate faunal region. The chief evidence that New Zealand was once joined to Norfolk Island, New Caledonia and New Guinea is found in the fact that two cuckoos—the long-tailed and the shining—still migrate between New Guinea and New Zealand along this route, going and coming every year, and travelling long distances over the sea. Certain migratory plovers also perform this journey, and also visit Fiji and the neighbouring islands.

It is impossible to present any considerable portion of the evidence available within the limits of a couple of pages of this journal, but the conclusions arrived at, after a cursory survey of the birds of the Pacific islands, are as follows:—New Zealand was at one period joined, with Norfolk Island, New Caledonia, Fiji, the New Hebrides, Solomons and New Guinea, to Australia in one continental mass, cleft from the south along the Australian coast by the Tasman Sea. A gradual subsidence early isolated New Caledonia, Norfolk Island and New Zealand, still one land mass, from a second land mass composed of Australia, New Guinea, the Solomons, New Hebrides and Fiji, though possibly Norfolk Island and New Caledonia had some chain of connection with the New Hebrides and Fiji after the present islands of New Zealand were isolated. The weak point in the argument is the fact that the only land mammals of New Zealand are two bats, which seems to argue against an absolute land connection.

However, I leave my theorising at that, with a free admission that the theory is not by any means entirely new. The subject is a fascinating one, and if I have, in my ignorance of a fascinating branch of science, rushed in where geologists fear to tread, I trust to be duly corrected.

NATURAL HISTORY CLASSES AT THE SYDNEY TECHNICAL COLLEGE.

A SHORT account of the courses in Zoology and Botany at the Technical College, Sydney, is given here in order that any young students of Natural History who have felt the need of some systematic training in this work may know where such instruction is imparted.

ZOOLOGY.

In the Zoology classes the subject has been approached in such a way that students are enabled to refer an organism which they may happen to meet to its class, and generally to its order; to tell something of its anatomy, its life-history, its economics, and its relationship to other animals. The subject is dealt with as a whole in preference to specialising a class or an order. This is an advantage from the point of view of Nature Study. The materials for class study are chiefly drawn from the fresh-water ponds and the sea beaches.

As an introduction to the subject, the *Amœba*, regarded as one of the lowest and simplest of animals, is studied. Then the various classes and orders of unicellular animals (Protozoa) are dealt with, the microscope being used in examining examples of each. Then follow the description and examination of typical animals belonging to the various Phyla, such as sponges (Porifera), Polypes, jellyfish and other Cœlenterata; flukes and tapeworms (Platodes); round worms (Nematodes); earth and marine worms (Annulata); examples of Crustacea, Insecta and Arachnida (Arthropoda); of Mollusca; and, finally, of Vertebrates, *e.g.*, fish, frog, lizard, bird and rabbit.

In the *practical class*, examples of many of the above are dissected, whilst others are examined microscopically. The students are encouraged to make collections, and are taught how to prepare specimens for the microscope, and how to preserve larger varieties. Excursions are taken at frequent intervals to give the students an opportunity of collecting and of observing living animals in their normal conditions. In addition, his interest in nature is stimulated to a greater degree. The economics of the various classes are mentioned. Animal parasites receive considerable attention, and, when interesting to ordinary nature students, their life histories are given.

BOTANY.

The work of the course in Botany extends over two years. In the first year the external morphology of plants is first considered, dealing with the structure and various modifications presented by the several organs of the plant's body—stem, root, leaves, flowers; then a short sketch of the structure of the tissues, followed by an account of the Physiology of Plants—fertilization, formation of the seed, and development

into the new plant. Finally, about 15 or 20 Natural Orders of flowering plants are selected, types of which are examined in a practical way in class. Throughout the year the work is illustrated by specimens, demonstrations and microscopic preparations. Not only is the structure and physiology of plants discussed, but their development, their habits, the collecting and preserving of specimens, the formation, care and arrangement of small collections of plants for private or school purposes, and, in dealing with the Natural Orders, the affinities of plants and their various uses to man are discussed.

The second-year work embraces a thorough training in work with the microscope, including the preparation of botanical material for microscopic work, section-cutting, staining, etc. In the lecture work the plant kingdom is treated as a whole, an account being given of the lower groups of plants such as the Algae, Fungi, Mosses, etc. The structure of plant tissues is treated at much greater length than in the first year; and about 30 Natural Orders are studied in regard to their structure, relationship, distribution and economics.

For both classes a number of excursions (about 15) are held throughout the year for the purpose of observing plants under their natural conditions, and in order to begin to learn something of the Australian Flora by acquiring a knowledge of the plants of the Sydney and surrounding districts.

OBITUARY.

ON the 31st January of the present year Mr. F. E. Grant, F.L.S., a Vice-President of the Club, passed away after a brief illness. By the demise of this gentleman the Club sustained severe loss. He was a constant attendant at the council and general meetings of the Club, whose work he did much to advance. It is, however, in the broader field of science that he will be most greatly missed—a field in which he loomed conspicuously. Although a young man—he was only 40 at his death—he had contributed a considerable number of memoirs to the journals of learned societies, and there yet remains to be published a posthumous paper from his pen dealing with the Crustacea of Norfolk Island. Among workers in Australian biological science few had devoted themselves to the study of our native marine and fresh-water Crustacea, and it was in view of this that Mr. Grant applied his energy and skill to its study. How ably he performed his task the scientific work of the later years of his life bear eloquent testimony.

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AN ENTOMOLOGICAL PRIZE.

THE President offers a prize for the Best Collection of Insects, the prize to be awarded and presented at the annual meeting in August, 1908. Competitors must be JUNIOR MEMBERS of the Club or its Branches, and elected before the annual meeting in August, 1907. The collections must, in the case of Sydney members, be confined to specimens from the County of Cumberland; and in the case of branch members to a somewhat similar area in the neighbourhood of the branch. Points will be assigned according to the following scale:—Quantity, 15; quality, 30; mounting, 30; naming, 10; labelling, 15. For further particulars apply to the Hon. Secretary.

NOTES AND COMMENTS.

THE USEFUL BIRDS OF SOUTHERN AUSTRALIA.—This is the title of a new book from the pen of that enthusiastic and capable naturalist, Mr. Robt. Hall, F.L.S., C.M.Z.S., and is one that will be welcomed by all lovers and students of bird life. The work is written in an easy and pleasant manner, and deals with the majority of birds found in Southern Australia and Tasmania south of an imaginary line from Brisbane on the East, to Shark's Bay on the West, excepting the sub-tropical area immediately south of Brisbane. By the term "useful" is meant all those birds of value to the orchardist, agriculturalist, gardener and pastoralist—that is, insect-eating birds. A key to each bird is given, with a reference to its nest and eggs. The work is illustrated by about 100 half-tone blocks, and a frontispiece consisting of a map defining the three great faunal sub-regions known as the Torresian, Bassian and Eyrean. So that the work shall be as instructive as possible, derivations of scientific names are given, together with accentuations, and these have been taken from the author's "Key to the Birds of Australia," as approved by Professor Tucker, Litt.D., with expansions. The work is further enhanced by a glossary of technical terms, and an explanatory chart of a bird, showing the principal external characters. The book throughout bears evidence of much care and thought, and this should commend it to all teachers interested in Nature Study. Both author and publisher (the latter, T. C. Lothian, Melbourne and Sydney) are to be congratulated upon their efforts to present so admirable and concise a work.

BIRDS DESTROYING BUTTERFLIES.—Mr. E. T. Gould, Verona, N.S.W., sends us the following communication:—"December 16th, 1906.—While observing the movements of two old and

three young 'wagtails,' I saw the old ones repeatedly bring the young ones butterflies (*Heteronympha merope*), and my boys said that they saw other 'wagtails' catching and eating a white kind of butterfly—very numerous just now—and that they saw a 'pee-wee' (*Gralina australis*) eating the same kind of butterfly."

CATERPILLARS AND ANTS.—Herr H. Vrehmeyer, Reissigerstr. 21, Dresden, Germany, is anxious to obtain larvæ of Australian Lycinidæ and the ants associated with them. Herr Vrehmeyer is making a special study of this subject. Can any of our members help him?

EXCHANGES DESIRED.—Dr. Hans Brauns, Willowmore, Cape Colony, S. Africa, is desirous of obtaining Australian bees and other Hymenoptera (named or unnamed); in return he will send African insects. G. Van Roon, 2E Pijnackerstraat, No. 18, Rotterdam, Holland, asks for Lucanidæ Carabidæ, Buprestidæ, Cerambycidæ, and Cicindelidæ, for which he offers Indo-Malayan, African, or European beetles.

MOSQUITOES AND BUTTERFLY PUPE.—The larvæ, or "wrigglers," of mosquitoes feed on vegetable or decaying matter, but the adults are mixed feeders. As a rule, the latter feed on vegetable juices; but all animals are liable to be attacked by them, and even some insects. A naturalist has recorded mosquitoes as destroying large numbers of butterfly pupæ in South America. It would be interesting to know if any of our Australian species are similarly persecuted.

FLEAS AND DISEASE.—Mr. Carl F. Baker, in "The American Naturalist," vol. xxix. (1905), shows that the fleas of rats in the warmer regions of the earth are close relatives of the flea specific to human beings, and thus far more likely to bite human beings than are the fleas in the colder regions, which are only distantly related to *Pulex irritans*, Linn. Mr. Baker also states that Dr. Carrasquillo, of Bogata, has found the bacillus of Hansen (leprosy) in the intestinal canal of fleas.

BUTTERFLY DESTROYERS.—Mr. J. Kershaw, in Transactions of the Entomological Society of London (1905), reviews the factors in the elimination of butterflies by other animals as he observed them in S. China. The list includes spiders, flies, ants, bugs, centipedes, lizards, and birds. His notes suggest that butterflies which have escaped the sundry and manifold dangers of the egg, larva, and pupa stages have collectively little to fear in the perfect state.

TERRESTRIAL MITE ADAPTED TO MARINE LIFE.—N. Passerini has recently discovered a terrestrial mite lurking among the blocks of rock deposited around the base of the tower of Meloria (Italy), where prolonged immersion in salt water is inevitable. The mite, which Dr. Berlese has named *Erythræus*

passerini, probably utilises the air imprisoned in the capillary passages in the rock. In any case it has become adapted to marine life.

CARL VON LINNÆ.—May 23rd will be the two-hundredth birthday of Linnæus, that great naturalist whose name is honoured wherever men of learning congregate. The University of Upsala, Sweden, proud of their great man, who may be aptly termed the "father of modern biologists," has issued an invitation to all scientific institutions throughout the world to join them in celebrating the occasion. We at the antipodes are prevented, by time and space, from taking an actual share in these festivities, nevertheless we shall share in the spirit of them. It is proposed to hold a special meeting of the Linnæan Society of New South Wales on the date referred to, and, that the occasion may be fittingly marked, friends of the society will be invited to attend. It is probable that several gentlemen will deliver short addresses on the work, life and time of Carl von Linné.

J. B. DE LAMARCK.—After Linnæus, one of the foremost naturalists of the eighteenth century was J. B. de Lamarck, whose work was carried on amid the turmoil and troubles of the French Revolution. Notwithstanding the exciting times in which he lived, in addition to his labours as a geologist, he contributed largely to zoological and botanical literature. Sad to relate, he died blind and neglected, in poverty and misery; but his works survive, and they stand with us to-day as classics. It is only meet that such a name should be revered, and to this end a movement is now on foot to commemorate his memory by a statue in the Paris Museum of Natural History. It is pleasing to record that Sydney naturalists, recognising the great work Lamarck did for Australian Natural History, have asked permission to be included in the list of subscribers to the proposed statue.

NEW RECORDS OF ARANEIDÆ.—Mr. Wm. Bullock, master of Parkville Public School, near Scone, has recently collected the beautiful Araneid, *Argiope protensa*, L.K., in his district. This species was originally recorded from Bowen, Port Denison, Queensland. The specimen collected by Mr. Bullock has somewhat darker markings than the form described by Koch. The interesting fact, however, is that our knowledge of its range is extended. Another interesting record is the occurrence at Port Darwin of *Conothele malayana*, Dol. Up to the present the genus *Conothele*, Auss., has only been known from Central Asia, Malaisia, and Papua. It is only reasonable to expect that many species occurring in New Guinea, and at present only known to exist there, will yet be found in the Northern Territory and tropical Queensland.—W. J. RAINBOW.

THE
Australian Naturalist.

VOL. I.

JULY, 1907.

PART 7.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

THE ORDINARY MONTHLY MEETING was held at 82 Pitt Street on Thursday evening, April 4, 1907, the President, Mr. G. A. Waterhouse, B.Sc., F.E.S., in the chair.

ELECTIONS TO MEMBERSHIP.—Messrs. F. Taylor, Technological Museum, Sydney; H. Cherry, Australian Museum, Sydney; C. J. Woollett, Sup. Public School, W. Leichhardt.

BUSINESS.—The evening was mainly devoted to demonstrations: Dr. W. G. Woolnough, on "Methods of Preparing and Mounting Rock Sections for Microscopic Examination"; Mr. G. A. Waterhouse, B.Sc., "Mounting and Preserving Butterflies"; Mr. L. Harrison briefly addressed the meeting on "Methods and Implements Employed in Obtaining Birds' Nests and Eggs"; and Mr. Wm. B. Gurney, on "Various Methods of Pinning and Mounting Insects."

THE ORDINARY MONTHLY MEETING was held in the Board Room, at 82 Pitt-street, on Thursday evening, May 2, 1907, the President being in the chair.

ELECTIONS TO MEMBERSHIP.—Miss S. A. Wood, Public School, Singleton; and Miss J. Wilson, Woollahra, Sydney.

PAPER.—Mr. W. W. Froggatt, F.L.S., delivered an interesting address on "Galls and Gall-making Insects," a *resumé* of which appears on another page.

THE ORDINARY MONTHLY MEETING was held in the Board Room, 82 Pitt Street, on Thursday evening, June 6, 1907. The President was in the chair.

BUSINESS.—The President announced the Council wished for an expression of opinion from members at this meeting what form the Badge for the Club should take. On the motion of the Hon. Secretary, seconded by Mr. S. J. Johnston, it was decided the Badge should take the form of a design in metal representing some natural object or objects.

PAPER.—Mr. D. G. Stead read an interesting paper on "The Eggs and Breeding Habits of Fishes."

N.S.W. NATURALISTS' CLUB. ARMIDALE BRANCH.

At the Annual Meeting of the above Branch (which, we are glad to note, is flourishing), Mr. W. G. Thomas presiding, the following report was submitted by the Hon. Secretary, Mr. A. E. Hunt:—

“The operations of the Armidale Natural History Club for the past twelve months have been of a highly satisfactory character. The membership roll totals 30, and enthusiasm in the work of the Club has been well maintained. One great incentive to increased effort and deeper research has been the affiliation of the Armidale body to the N.S.W. Naturalist Club in Sydney. This brings the Club into touch with the leading scientists of the State, who have expressed their readiness to assist in every possible way. It is recognised that there is an immense field for original research in the natural history of Australia, and the parent Association looks to its Branches to help in unravelling the mysteries and discovering the wonders and beauties of nature. This may largely be accomplished by the collection of local specimens, in the recording of life histories, especially in the insect world, in the analysis of rocks and soils, in microscopic investigation, etc., and it is along these lines that the Club has been working.

“There have been in all 14 meetings during the year, under the Presidency of Mr. W. G. Thomas, with Mr. J. Scholes and Mrs. L. Ross as Vice-Presidents, the Hon. Secretary and Treasurership having devolved upon Mr. A. E. Hunt.

“One of the most pleasing features of the Club's operations has been the original research undertaken by members, the results of which have been made available in papers and lectures. Mr. Cory, of Saumarez, gave a highly-appreciated paper on reptiles, and exhibited a number of interesting specimens. ‘Silica and its Compounds’ formed the subject of a most instructive paper by Mrs. Mallam, the specimens exhibited in illustration thereof being numerous, rare, and beautiful. Members spent a very pleasant and profitable evening when Mrs. A. H. Perrott read papers dealing with fossil wood, the cicada, and the New Zealand gum-fields. The best thanks of the Club is due to Mr. H. Tonkin for his lantern lecture on ‘The Geology of New England,’ which was open to the general public, and attended by a large and appreciative audience. The life-history and anatomical wonders of the cicada were unfolded to members by Mrs. L. Ross. By special request, the Hon. Secretary read the address of the President of the N.S.W. Naturalists' Club on ‘A Study in Natural Selection,’ and at the same time seized the opportunity to give a few hints on the collection and preservation of specimens, and to briefly describe the wonders revealed in the aquarium

of Mr. Finckh, of Sydney. A special treat was the lantern lecture on the 'Great Barrier Reef,' by Mr. M'Millan, to whom the Club owes a debt of gratitude; and in this connection the best thanks is due to Rev. H. S. Buntine, for lending and working the lantern. Mr. J. Newbery lectured on 'The Bee,' from a natural history standpoint, and showed, by means of microscopic slides, the wonders of structure of this marvellous little insect.

"The Club has by no means confined its work to papers and lectures, but field work has been a prominent feature. Two excursions were organised by Mrs. A. H. Perrott—one to Bald Knob, where geological observations were the chief feature of the outing, and another, which started from 'Woodleigh,' for the investigation by night of the cicada, these insects at the time being in actual process of quitting the earth prior to bursting forth as perfect creatures. On both occasions much useful information was gleaned. Another well-attended outing was one to the local water-works, where the day was spent in observing and collecting botanical and entomological specimens. During the afternoon of March 2nd last, members were given the opportunity of viewing Mr. A. E. Hunt's collections, and at the same time examining a set of microscopic botanical slides kindly lent by the Sydney Technological Museum for the purpose. Members are indebted to several local residents for the loan of microscopes.

'Financially, the Club is sound.'

AUSTRALIAN INSECT GALLS.

(*Abstract of Lecture by W. W. Froggatt, F.L.S.*)

ALTHOUGH this paper is entitled "Insect Galls," there are, nevertheless, many true galls occurring upon plants that are produced by bacteria, nematode worms and mites. These are produced chiefly upon the foliage; but many abnormal excrescences are due to fungus spores. Then, again, aborted flowers and branchlets are frequent, which have been produced by injuries received in a natural manner. These fantastic growths are not galls in the strict sense of the word as applied in these notes.

Dr. H. Ross, of Munich, in a paper on "Gall Formation of Plants: Their Development, Structure, and Form," says: "Except for the abnormal growth of gall cells, gall formations are distinguished from the peculiar diseases of plants by the fact that strict biological relations, often of a very complicated nature, exist between the galls and the parasites which cause them. The gall formations, however, are quite at the service of the parasite, and through them only disadvantages accrue to the plant which shelters them, either through consumption of nourishment, or unfavourable development, or obstruction of

tissues or organs which are serviceable to the plant. We cannot, in the case of gall formation, speak of a *symbiosis* that is a joint life of two organisms in which both parts obtain equal advantage from one another. It is only in quite exceptional cases that the gall-producer brings true services to the sheltering plant."

Formerly it was supposed that when an insect deposited its eggs in the tissue of a plant it injected an irritant fluid at the same time, which latter, in its turn, caused the formation of the growth we call a gall. In some cases (notably Gall-flies—*Cynipidæ*) the fluid, if of any service at all, is probably to keep the puncture, caused by the ovipositor, open, because if the wound healed over, the egg would in all probability be crushed. Experiments made by European entomologists have shown that when an egg is extracted from the bark before it has had time to hatch, no gall-growth has resulted. How, then, is the gall formed? The answer is—by secretions discharged by the larva, together with the local irritation caused by the creature gnawing the tissue that surrounds it, and it is this that gives shape to the gall.

European oak-galls are the best known. Some occur upon leaves, and others on the terminal buds. These, known as "Oak Apples," are caused by some species of *Cynips*, or gall-wasp. In former times an abundant growth of oak apples was supposed by country folk to herald a good season and bountiful harvest—a safe surmise, as the same condition was responsible for both.

In commerce, the gall most frequently used was obtained from stunted oaks, *Quercus infectaria*, a species common in the Levant. The products from this was ink and dye. A large number of galls was used annually in this industry; indeed, upwards of 1,000 tons of these oak apples used to be imported into England. They were the work of larvæ of a species of *Cynips*, and were round, about the size of a marble, and covered with small tubercles. The most valuable came from Syria and Smyrna. On the borders of the Dead Sea there is another species of stunted oak, from which are obtained galls of considerable size, and famous in history as "Apples of Sodam," "Mad Apples," or "Dead Sea Fruit." These are caused by the punctures of Gall Gnats. Many curious galls are found in Japan, large quantities of which are used in the arts and medicine.

In Europe the typical gums, *Quercus* (oaks), appear to be the most affected by galls; and the same remark applies here, in Australia, to our typical Eucalypts, or Gum trees. It is upon the latter that our largest and most striking forms occur.

COLEOPTERA.—There is nothing very striking about the galls constructed by beetles. Several species of Buprestidæ form

galls upon the roots of small shrubs. In a paper in the "Proceedings of the Linnæan Society of New South Wales," 1892, I described those formed by three species of *Ethon*. Of these, *E. corpulentum* and *E. marmoreum* form rounded, soft-shelled galls like small marbles, often in clusters of a dozen or more on the roots of *Dillwynia ericifolia*, whilst *E. affine* produces rounded swellings upon stems of *Pultenæa stipularis*. A fourth Buprestid (*Paracephala cyaneipennis*) forms galls similar to the last on stems of *Casuarina distyla*. Numbers of these may be seen upon trees growing at the back of Watson's Bay. These galls are woody, hollow, and more or less rounded.

LEPIDOPTERA.—I only know of one lepidopterous gall, and that is due to some moth, which latter is at present undetermined. It infests the terminal branchlets of *Eucalyptus piperita*. This gall is elongate-oval, and within it the larva feeds and pupates.

DIPTERA.—Species of the family Cecidomyiæ are known properly as "Gall Gnats," although many of them do not construct galls. Of those that do, that formed by *Cecidomyia acacie-longifolia* is one of the most remarkable. The female, when depositing ova, punctures either flower buds or seed embryos, and the resulting larvæ aborts each seed-pod into a slender, irregular, curved, cylindrical tube. As they grow, these distorted seed-pods coalesce, and form a rounded base, the latter being attached to the twig by a regular stalk. Sometimes every seed-pod upon the tree is so aborted. Other similar galls occur upon other wattles. In the West, *Acacia pendula* frequently has its seed-pods produced into a regular rounded form. *C. frauenfeldiæ* attacks leaf-buds of *Leptospermum*. These latter are generally distorted into a rounded mass of bracts, all fitting loosely over each other like the petals of a rose-bud. In these galls, which are common in the vicinity of Manly and Botany, the larvæ will be found, if sought for, lurking at the centre near the base. Several species of Diptera form gouty swellings on twigs, and one fine species, *Horomomyia omalanthæ*, produces red, shot-like galls on leaves of some *Eucalyptus*, and these usually spring from the midribs of the foliage affected. Other species, included in the families Agromyzidæ and Trypetinidæ, also attack several of our native trees.

HYMENOPTERA.—In point of species, there are more insects in this order than any other that are responsible for vegetable galls. The latter are also more uniform in their structure than is the case of those made by other insects. Hymenopterous galls are found on buds, flowers, seeds, twigs, and foliage. Some wasps are parasitic, and many of these deposit their eggs in galls that have been already formed. From these ova tiny grubs hatch out, and, being hungry, they set

to work to devour the legitimate inmates. In addition to the parasitic forms, there is an interesting group known as "inquilines," and these may be defined as uninvited guests which feed within the tissue, or cell, of the gall, but yet do no injury to the rightful occupants. Hence, if a novice takes up the study of galls and gall-makers, he will be both puzzled and surprised at the extent and variety of species he will breed from a single type of gall.

The family Chalcidæ embraces a large number of species of this group. Those included in the genus *Megistigma* have, in both sexes, narrow heads, but the females are provided with a bristle-like ovipositor. Some of these insects attack the leaves of young gum trees, causing them to swell out into gouty excrescences, while others are guests in soft, fleshy galls on the wattle and kurrajong, which result from fungoid diseases; others, again, form shot or wart-like galls upon the foliage of all kinds of trees. Some of these wasps are of solitary habits, and some are gregarious. The different species of *Acacia* are rich in galls of Hymenopterous insects, and these are produced sometimes upon the branchlets, and sometimes upon leaves and flower-buds.

HOMOPTERA.—Within this order is included a number of tiny insects much like diminutive Cicadas. These belong to the family Psyllidæ. Their larvæ are furnished with sharp, beak-like mouths, with which they puncture the tissues of their food-plants. Although many of these creatures are naked, or only enveloped in white flocculent matter, and others cover themselves with shells or nets of fantastic shape, formed from the sap of the plant, there are a number of species that produce well-defined galls upon the foliage of Eucalypts.

COCCIDÆ.—It is remarkable that, with one exception, galls made by scale insects are, so far as we know at present, peculiar to Australia. The trees affected by them include the Eucalypts, *Leptospermum*, *Melaleuca*, and *Casuarina*, or She-oaks. Larvæ born within the shelter of these galls escape through the pin-prick or slit-like opening at the summit of the gall. These larvæ appear like yellow dust, but when placed under the microscope each speck is seen to be an oval, flattened, shield-shaped creature with well-developed legs, antennæ eyes, and a short, beak-like mouth on the underside of the head, while the outer edge of the upper surface is fringed right round with short, truncate, glassy filaments.

Galls of Australian Coccids of the sub-family Brachyscelinæ have no parallel in any other part of the world on account of their remarkable form, size, and the difference of shape in the sexes. The genus *Apiomorpha* comes first in importance. The female galls are produced upon leaves or twigs, and are either rounded, oval, or angular. The male galls, which outnumber the females by thousands, are usually

found upon the leaves; they are slender, cylindrical tubes, and bell-shaped at the apex. One of the most curious of these galls is that made by the female of *Apiomorpha duplex*, which, growing directly from the side of a slender twig, is produced into a stout, four-sided gall, sometimes three inches in length, and having a keyhole-like slit at the apex; each outer side at the apex of the gall has a long, tapering, flattened, sometimes straight and sometimes curling appendage which often attains a length of six inches. *A. munita* is a similar, but smaller, species of "horned" gall. The small males of each of the foregoing galls often form great masses of contorted tissue composed of immense numbers of short, simple tubes, sometimes referred to as "vegetable coral."

THRIPIDÆ.—There are a number of curious galls formed by members of the order *Thysanoptera*, a peculiarity only known in Java and Australia, as the typical forms common in Europe live, like aphids, upon the foliage, and are known as "black fly." They form three different kinds of galls. The primitive ones are made simply by rolling over of the edges of the leaves, so that often both edges curl towards each other and form two rolls. The second group attack the terminal buds and produce thin, biscuit-like structures, forming irregular, rounded, corrugated masses. In the third group the insects attack the leaves, and often abort the whole leaf into a bubble-shaped gall containing hundreds of insects. These are most common on the different *Acacias* growing in the Western country:

MANNER OF EGG-LAYING OF THE DRAGON-FLY (*LESTES LEDA*).

(By W. B. Gurney.)

THE exact manner in which this common dragon-fly deposits its eggs in the tissue of pond plants has not, to my knowledge, been recorded, and the following brief account of observations made on the 29th March, 1907, is therefore given:—On this date—a warm, sunny day—numbers of this common, blue-banded, slender-bodied dragon-fly were observed flying about a pond at Botany (Sydney). A large percentage were flying in pairs, the anal appendages of the male clasping the neck of the female. A pair would settle on a weed projecting from the water, and the female commence inserting her eggs into the plant tissue, puncturing a hole and inserting a single egg at one and the same time by means of her short, bristle-like ovipositor. When thus depositing eggs, the abdomen of the female may be much bent, while the tip is worked over the surface of the leaf, or stem, and the eggs are sown in, as it were, by a series of quick insertions and withdrawals of the

ovipositor. The eggs are laid in an irregular, winding course as the female crawls slowly backwards and down the leaf, or stem, of the weed, dragging with her the male, which is still attached to her neck, while he also clings to the weed with his legs. In this manner the pair would gradually descend till the female might become wholly submerged in the water, and often the male also. The eggs are, in fact, generally inserted in those parts of the weeds which are under water. Some half-dozen pairs, thus submerged, were easily caught, and the method of insertion of the ovipositor could be examined even with the lens, as the insects did not readily seek to escape while thus engaged. Several pairs were observed to be two or three inches below the surface of the water, and one pair was observed to remain completely submerged for seven minutes—timed by the watch. The thorax and wings, on becoming submerged, were noticed to retain a film of air about them which probably would supply sufficient air to the tracheæ for a lengthened stay in water.

Examination of weeds upon which the insects were captured in the act of depositing eggs revealed the eggs to be present in large numbers and embedded in the tissue. The eggs are minute, slender, white, cylindrical objects, measuring 1 millimetre in length by only about $\frac{3}{10}$ of a millimetre in width.

NOTES AND COMMENTS.

AUSTRALIAN INSECTS.—This is the title of an admirable work by Mr. W. W. Froggatt, F.L.S., Government Entomologist, and a former President of this Society. The work is a comprehensive one, in that the author has something to say upon each order of insects occurring in Australia; in fact, the book is an introduction to the study of Australian Entomology generally, and should be of practical utility in paving the way for future students. It follows that in a work of a little over 400 pages, and one so profusely illustrated as this is, that each order or group can only be treated upon briefly; nevertheless, the author has seized upon and availed himself of all that is essential in a work of its scope. The book contains much useful information, not usually found in works of this nature, such as chapters on "The Collection and Preservation of Insects," "Museum Collections and Types" (a most valuable contribution, indicating, as it does, the institution, or private collection, where types of Australian species are deposited), and, finally, a list of "Publications Dealing with Australian Entomology." The work is admirably illustrated, there being 180 figures in the text, 37 plates, and a frontispiece. We

congratulate the author upon the care and trouble bestowed upon the work.

THE TASMANIAN NATURALIST.—We have received, through the courtesy of the Hon. Editor of the "Tasmanian Naturalist," a copy of the first issue of that journal—the official organ of the Tasmanian Field Naturalists' Club. The present issue contains some well-written articles of much interest to Naturalists, such as "The Coccidæ," "Swan Shooting on the East Coast of Tasmania," and "The Breeding Habits of Bronzewing Pigeons," the writers being Mr. A. M. Lea, F.E.S., Mr. E. A. Elliott, M.A.O.U., and Mary G. Roberts, M.A.S.E., &c. The two first articles are illustrated. We cordially congratulate our Tasmanian friends on their forward movement.

RATE OF GROWTH OF STALACTITES.—An enormous space of time is generally assigned for the growth of stalactites in limestone caverns, and no doubt some of the larger examples must be of great antiquity; but at the cave in the vicinity of Moore Creek, eight miles N.W. of Tamworth, the rate of growth is at least perceptible. At the time of the discovery of these caves—about four years ago—there were in existence a number of large and beautiful stalactites. Since that date, however, vandal hands have destroyed most of these natural beauties; but already, on the stumps of these stalactites, new ones are forming. The length of these later formations varies from $\frac{1}{4}$ to $\frac{1}{2}$ inch, and they average about $\frac{1}{4}$ inch in diameter, but in one instance I noticed an example, the length of which was over 2 inches. This, of course, must have grown within the last four years, and is greatly in excess of the reputed rate of growth of stalactites, and may be interesting as showing the difficulty of computing the age of limestone caves from this evidence.—Carl F. Laseyron.

EGGS AND BREEDING HABITS OF FISHES (illustrated by diagrams and actual specimens).—Mr. Stead contributed a paper on the "Eggs and Breeding Habits of Fishes" at the June meeting of the Club. In this paper the author describes in detail the natural divisions into which the eggs of fishes group themselves, a number of local examples being particularly brought forward. Some of the many diverse methods followed by fishes in an endeavour to keep up the continuity of their species were touched upon, particular prominence being accorded those species in which parental solicitude and care are especially marked. A complete list of those Australian fishes which produce pelagic eggs was given, and a number of those which reproduce by means of eggs of a demersal nature were mentioned. Mr. Stead stated that a leading firm of publishers desired to print the paper, with illustrations, as a small "Nature-Study" book, and that this would be done. The

President said that he was sure the paper, when published, would be welcomed by the Club.

THE COMMON HIVE BEE.—In the January (1907) part of "Annales de la Société Entomologique de France," E. L. Bouvier has a paper dealing with the nidification of swarms of the common *Apis mellifica*, Linn., that have become wild. The paper is illustrated not only by text figures, but also by half-tone blocks reproduced from photographs. The former are diagrammatic, but the latter, from nature, show the formation of the honey-comb upon branches of trees in Jardin des Plantes, Paris. Such occurrences are not common, although previous records are known. Another instance, in France, is recorded from the Jardin des Luxembourg; while, in England, Curtis has remarked an occurrence that came under his notice in October, 1838, where a swarm had nested among the branches of a tree in Lord Mamesbury's plantations, near the river Avon, a short distance from Sopley. What makes these occurrences so interesting is that the honey-combs and nests are fully exposed to the weather. Caves in rocks, and disused chimneys, have been known in many lands to form an asylum for vagrant swarms. In this country, nests in hollow trees are familiar enough, and Mr. Froggatt has informed me of one he saw under the ledge of a rock shelter, which, although exposed to a subdued light, such as one finds in such places, was, at the same time, protected against the weather.

A GARDEN SNAIL.—C. W. Johnson, having collected all the references to the appearance and distribution of the English garden snail, *Helix hortensis*, in America, is inclined to think ("Nautilus," 1906, p. 73) that it has not been introduced in that country by man within comparatively recent years, nor by the "Vikings," but is a much older inhabitant of that continent.

AUSTRIAN EXPLORATION IN NEW GUINEA.—Dr. Rudolf Pösch, well-known for his malaria researches in W. Africa, made, during 1904-6, with the aid of the Imperial Academy of Sciences in Vienna, anthropological journeys in New Guinea, N.S. Wales, Solomon Islands, and Bismarck Archipelago. In these two years he travelled along three-quarters of the coast of New Guinea. At five spots he tarried for some length of time, after which he wandered into regions of the interior, still in part wholly unknown. The material taken home by him included 300 measurements of living persons, 15 skeletons, 80 skulls, many anatomical preparations, 1,500 photographs, and upwards of 3,000ft. of cinematograph films (taken by bioscopic camera), representing dances and scenes of aboriginal village life. Included in the collection are also 90 plates for the phonographic archives of the Academy, with a view to the study of the language, songs, and music of the natives. In

addition to all this, 2,000 objects of ethnological interest were also collected. Itineraries of the hitherto unknown regions were also kept, and altitudes noted in them.

AQUATIC COCKROACH.—Nelson Annandale ("Journ. Asiatic Soc., Bengal," ii., 1905, pp. 105-7) discusses a species of *Epilampra* living in an Indian jungle stream. The tip of the body is held out of the water, and the last spiracle is of a slightly tubercular nature, and projects at the side from below the posterior extremity of the seventh tergite, being provided with a thick ring of chitin. The author also notes that an aquatic glow-worm (Lampyrid) larva possesses a star-shaped funnel and tracheæ which can be extended from the posterior end of the body.

NOTES ON SYDNEY LARVÆ AND PUPÆ.—It must not be supposed that with the advent of the winter months all collecting of insects is to be placed on one side. The perfect insect, it is true, is seldom seen on the wing during June and July, though at Killara Railway Station, at midnight on the 18th June, five large moths belonging to two distinct species were taken. In addition to this, the night was very wet. Most of the collecting at the present time, however, consists in the search for larvæ and pupæ. Insects in these stages seem to withstand the cold of winter very much better than in the perfect state. At the present time pupæ of several of the *Papilio*s may be found attached by the tail, and a silken girdle round their middle, to their food plants or neighbouring fences, as, for example, *P. sarpedon choredon* on the Camphor Laurel. When on a fence this pupa looks exactly like a folded-up Laurel leaf. Young larvæ of *Delias nigrina*, and, if one is fortunate, of *D. harpalyce*, may now be found on various species of *Loranthus* (Mistletoe). On this same food plant at night-time the *Ogyris* also feed. Amongst the *Satyrinæ*, numbers of young larvæ may be found by carefully searching the soft grasses in the shade of fences, near stones, etc. These larvæ are all nocturnal feeders, hiding by day amongst stems of the grasses, under pieces of bark, etc., and ascending the grass stems at night to feed—there they may be seen by the aid of a lantern. They may also readily be seen in the day-time by searching in suitable places amongst these grasses, often being knocked away from their hiding places by the hand, and then picked up off the ground. These larvæ are usually green, such as *Heteronympha merope*, *Xenica achanta*, and *Hypocysta metirius*; sometimes brown larvæ of *H. merope* are found, and *Ypthima arctous* is generally brown. They are all recognised by their forked tails. Their pupæ are usually attached to the grass stems, under logs, etc., but in the case of *H. merope* they are found under pieces of bark, unattached. The writer at one time found over thirty of these pupæ under a small *Nasturtium*.

plant. The Swordgrass (*Cladium*), if searched now, will yield many larvæ of Hesperidæ, and also of *Tisiphone abeona*, but, as this plant dries too quickly, and so crushes the larvæ to death, it is better to wait and collect these in the pupal stage in September or October, when they can be removed from their food plant. They are also nocturnal feeders. Many Lycænidæ may be found now, such as *Candalides hyacinthina* and the *Ogyris*—G.A.W.

MR. FROGGATT'S TOUR.—Members of the Club will, one and all, we feel sure, congratulate Mr. Froggatt on his having been selected to tour the world on behalf of the majority of the Australian States. His duty is to make investigations *re* Fruit Fly and other pests, and, considering his vast knowledge of economic entomology, the result of his enquiries should be of much public utility. Mr. Froggatt, who leaves Sydney on the 8th of July, will be absent a little over a year.

NOTES ON WEB-SPINNING ANTS.—This is the title of an interesting paper published in the June number of "The Victorian Naturalist," by Edward Jacobson. In the course of his remarks the author questions the correctness of the name applied to the Green Tree-Ant of Australia, namely, *Ecophylla smaragdina*, regarding the species rather as *Æ. virescens*. The first of these two names was applied by Fabricius to the Asiatic form, and the latter to the Australian. In support of his contention, the writer points out that the females of *smaragdina* are green, the males dark brown, and the workers red, hence the popular name "Red Ant" in English, and "Roode Mier" in Dutch. On the other hand, the workers of *virescens* are of the same green colour as their females, whilst the males are, the author believes, black.

CATERPILLARS PARASITIC ON ANTS.—Mr. Edward Jacobson records the following interesting observation in "The Victorian Naturalist" (June):—"In December, 1905, I discovered at Samarang a small caterpillar, which is a parasite of *Polyrhachis*. It lives in great numbers in the nests of the ants. The caterpillars are enclosed in the web of the nest (which is woven by the ants with the aid of their larvæ) in curious little cocoons, which they make in the shape of two-valved shells. As soon as they can get at the cocoons of the ants, they fasten them with some threads, and then devour the pupa, after having pierced the cocoon at the bottom. The moth which I reared from the caterpillar does not seem to have been described yet."

THE
Australian Naturalist.

VOL. 1.

OCTOBER, 1907.

PART 8.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt Street on Thursday evening, July 4, 1907, the President, Mr. G. A. Waterhouse, B.Sc., F.E.S., in the chair.

ELECTION OF AUDITORS.—Messrs. E. H. Biden and G. A. Morehouse were elected Auditors for the year 1906-7.

PAPER.—The Rev. T. Roseby, M.A., LL.D., F.R.A.S., gave a lecturette entitled "The Wider Outlook of Natural Science Studies." On the motion of Mr. Froggatt, seconded by Mr. S. J. Johnston, a vote of thanks was tendered to Dr. Roseby for his interesting address.

ANNUAL MEETING.—The Seventh Annual Meeting was held at 82 Pitt Street on Thursday evening, August 8, 1907, the President, Mr. G. A. Waterhouse, B.Sc., in the chair.

ELECTION OF MEMBERS.—Messrs. Brian, Simpson, Whitfield, L. Froggatt, R. W. Bretnall, F. W. Tingwell and Redshaw were duly elected.

ANNUAL REPORT.—On the motion of Mr. Hedley, seconded by Mr. Goldfinch, the annual report was adopted.

BALANCE SHEET.—On the motion of Mr. Garland, seconded by Mr. Carruthers, the balance sheet was adopted.

OFFICE BEARERS.—Office bearers for the ensuing year were elected as per list on cover, p. ii.

PRESIDENTIAL ADDRESS.—The retiring President, Mr. G. A. Waterhouse, B.Sc., B.E., F.E.S., delivered an address on "The History of *Papilio ægeus*: Its Distribution, Variation, and Life."

RETIRING SECRETARY.—On the motion of Mr. Waterhouse, seconded by Mr. Hedley, a vote of thanks was accorded to Mr. W. B. Gurney, who was retiring from the position of Hon. Secretary after three years' service.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt Street on Thursday evening, September 5, 1907, Mr. D. G. Stead, Vice-President, in the chair.

LECTURE.—After the routine business had been transacted, Mr. W. J. Rainbow, F.L.S., delivered an address entitled "Fungoid Diseases of Insects."

SEVENTH ANNUAL REPORT.

In furnishing the Annual Report on the work of the Club for the year ending 31st July, 1907, the Council is able to report a successful year, and an increase of membership.

At two meetings practical demonstrations on the methods of preparing, mounting and preserving natural objects were given, while at each meeting a certain part of the evening was devoted to notes, exhibition of specimens and discussions.

Four parts of the AUSTRALIAN NATURALIST have been published under the editorship of Mr. W. J. Rainbow. Each part has contained matter of interest, but the Editor is convinced that the Journal could be made much more useful if more members of the Club would take an active interest in its pages by contributing notes on matters that may come under their notice. As our Club is essentially a field club, and many members spend much time in collecting, this should not be difficult.

A three days' camping excursion at Ourimbah was held on the 10th to 12th November, 1906, and a number of insects, birds' nests and eggs, and botanical specimens were obtained. Thirty-two members and friends were present. Some eight or nine tents were in use, while a few were accommodated at an adjacent farm house. This outing was the first of its kind undertaken by the Club, and owing to the success which attended it in every way, is likely to be followed by similar excursions to various suitable districts.

In February, 1907, the President, Mr. G. A. Waterhouse, offered a prize for the best collection of insects sent in by the 31st July, 1908. Competitors are to be Junior members, and may be either Ordinary, Country or Branch Members. The specimens are, in the case of Ordinary members, to be obtained from within the county of Cumberland; in the case of Country and Branch Competitors, from within an approximately similar area. The points will be assigned as follows—Quality, 30; Mounting, 30; Quantity, 15; Labelling, 15; Naming, 10.

The formation of the Armidale Branch marked a new step in the advance of the Club. This Branch dates its affiliation from August 1st, 1906, and during the year has held many successful meetings and excursions in their district. A report of their proceedings was forwarded, and was published in Part VI. of the AUSTRALIAN NATURALIST.

The Council, in considering the question of a badge for the Club, has been met with some little difficulty with regard to the diverse views held by various members, and has decided to leave this matter in the hands of the new Council to be elected to-night.

The membership of the Club has been augmented this year by the election of 39 members. Six members resigned. The

death of the late Mr. F. E. Grant, F.L.S., was a serious loss to the Club and a source of much regret amongst our members who knew him personally.

The membership of the parent Society now numbers 154, and this, together with the 16 members constituting the Armidale Branch, brings the total membership up to 170.

The advance of the Club this year the Council can safely say has been marked, and again the Hon. Treasurer's balance sheet shows a satisfactory balance.

Finally, the Council desires to express its keen appreciation of the work done by Mr. J. R. Garland, the Hon. Treasurer, upon whose time somewhat serious demands are necessarily made, and who has always freely granted the use of his office for the Council meetings.

G. A. WATERHOUSE, President.

WM. B. GURNEY, Hon. Secretary.

THE HISTORY OF *PAPILIO ÆGEUS*.

(*Presidential Address by Mr. G. A. Waterhouse, B.Sc., B.E.*)

Fellow Members of the New South Wales Naturalists' Club:—

On the occasion of our Annual Meeting last year, you did me the honour in electing me to the Presidential chair of this Club, and in vacating that position for a most worthy successor I must thank you all for the kindly way in which my failings as a Chairman have been overlooked.

As already detailed in the reports of the Honorary Secretary and Honorary Treasurer, the year has been as successful as those in the past, if not more so. Our finances are in an eminently satisfactory condition, owing in a very large measure to our choice at the initiation to our Club of our Honorary Treasurer.

It is with feelings of regret that you will hear that our Honorary Secretary is relinquishing that position after an occupancy of three years. Mr. Gurney has worked hard in our interests, and to his guidance the Club owes a great deal. It must be borne in mind that the bulk of the work of the Club devolves upon the Hon. Secretary, and Mr. Gurney has ably attended to these duties for the past three years.

We welcome our new Honorary Secretary, Mr. L. Harrison, and can assure him that he will have our support while he occupies that position.

Mr. G. Goldfinch will undertake the duties of Assistant Honorary Secretary.

During the year the Club has, as usual, fulfilled to a certain extent the objects for which it was founded; our meetings and excursions have been well attended. You will learn with pleasure of the formation of a Naturalists' Club at Armidale. This Club has been affiliated with our Society, and has just completed a successful year and is showing signs of a very healthy vigour.

This year has been marked by an unusual activity in the publication of Natural History literature of a direct bearing on Australia. In September, 1906, an admirable account of the fishes of N.S. Wales appeared from the pen of Mr. D. G. Stead, and I understand is proving very useful in the State. Some two months back we were delighted with the publication of "Australian Insects," by Mr. Froggatt. Mr. Froggatt is to be heartily congratulated on this far from mean effort to popularise Entomology in Australia. This work will stimulate many to a study of our insects, and will fulfil a long-felt want amongst Entomologists and nature students generally. We hope that, beginning from this introduction to Australian Insects in general, we may in due course be furnished with more detailed and extended works on the various orders of insects. We all join in wishing Mr. Froggatt the best results from his travels abroad in other countries.

I may also be permitted to draw your attention to another publication that will very shortly be put before you, namely, "A Guide to the Study of Australian Butterflies," by your President of last year, Mr. W. J. Rainbow. This work should be a boon to those who study that popular branch of Entomology, the butterflies, giving as it will many new notes on their life histories, as well as collecting into the limits of a single work those accounts that have already seen the light of publication.

I may be allowed to refer to the important scientific facts that are likely to result from the trip of Messrs. Hedley and McCulloch to Murray Island, in the Torres Straits, and I am sure we heartily wish these gentlemen suitable weather conditions, and an abundance of material from their trip.

It was with very great regret that I heard of the death of our Vice-President, Mr. F. E. Grant, who died in the prime of his life and in the midst of important scientific investigations. It was my good fortune to become acquainted with Mr. Grant very shortly after his arrival in Sydney, and we enjoyed many conversations on scientific subjects of mutual interest. We deplore his death, especially at a time when his presence was required in the investigation of certain portions of our marine fauna in which so much activity is being displayed at present.

The main theme on which I wish to speak to you before vacating this chair is "The History of *Papilio ægeus*: Its life, variation and distribution." I have chosen this single species,

or grouping of closely-related forms, because I have been studying them for some time, and I think I will be able to put before you facts not only of interest to the Entomologist, but to all naturalists, especially those engaged in the study of geographical distribution. I will also illustrate by this species some of the difficulties with which a systematic Entomologist is confronted.

I am exhibiting to-night as many forms as I am able to bring together to illustrate my remarks, while some of my later views will in addition be based on the series of geographical variations of *Troides priamus* now before you.

My remarks will fall under the following headings :—

1. Life history.
2. History in literature.
3. Variation.
4. Distribution.
5. New Guinea as a centre of dispersion as exemplified by *Papilio ægeus* and *Troides priamus*.

1. *Life history*.—In speaking of the life history of this species I must of necessity confine myself to those facts I have observed myself, most of which have been obtained in the neighbourhood of Sydney. As in Australia this species ranges from Cape York to Sydney, and more rarely to the Northern portions of Victoria, some of my details may not be strictly applicable to other latitudes.

The most general food plant of this species during the last one hundred years has been the ordinary orchard citrus trees, and for that reason the species is popularly known as the large black and white orchard butterfly. Before the colonization of Australia, this could not have been its food plant, which was no doubt the Australian lime, a plant which occurs north of Newcastle, but I have never taken it feeding on this plant. Near Sydney I have seen pupæ in the bush on *Zieria lavigata*, and I have heard of larvæ being found on the same plant. Lately I was shown several pupæ on a plant of *Choisea* growing in a friend's garden, which was much eaten, evidently by the larvæ of this species. I exhibit portions of these plants to-night, and I believe these as food plants have not yet been recorded. The egg is spherical in shape, excepting at its point of attachment to the leaf of the food plant, smooth and pale lemon green in colour. It is usually laid in the Autumn, and before hatching the dark young larva can be seen within the egg shell. The young larva is a dark olive brown, usually with a whitish bar on either side, and bearing on the back a double row of short, fleshy spikes. When nearly full grown the larva changes to green with a pinkish white stripe on either side. As in all *Papilio* the larva is provided on the

second segment, behind the head, with a red osmaterium; this is a Y-shaped retractile tentacle which, when the larva is disturbed is protruded, at the same time emitting a strong odour. This odour often reveals the presence of a larva when searching citrus trees. The pupa, as is usual in this family, is attached by the tail and by a silken girdle round the middle; it is either green or mottled brown in colour, assimilating much to the particular colour of the stem of the plant to which it is attached. The duration of the pupæ stage is uncertain, and depends to a great extent on external causes. Mr. R. E. Turner one year at Mackay found that one batch of pupæ reared from larvæ emerged some considerable time before a previous batch which had also pupated in his possession.

In Sydney the perfect insect is usually on the wing early in the year, and is the largest butterfly in this neighbourhood. The sexes are very dissimilar, the male being black above with a white bar of spots across the apex of the forewing, a red anal spot on the hindwing, which also has a large central white area, which is not represented, on the underside. The female is much paler in colour, having no white bar on the forewing, while the white area of the hindwing is found both above and below as well as a nearly complete row of red spots.

2. *History in literature.*—As is only natural, the fact of the dissimilarity of the sexes has caused some little confusion. When the species was first sent to England by Mr. Alexander Macleay from Port Jackson, the sexes were considered as distinct species, and as such were described by Donovan in 1805 in the "Insects of New Holland." On plate 14, he proposed the name *Papilio ægeus* for the female, and on plate 15 the name *P. erectheus*. Neither Hübner (1816), Godart (1809), nor Boisduval (1832) recognised the sexes as one species, but Lucas (1835) and Boisduval (1836) speak of both sexes under the name of *P. erectheus*. Felder in 1864 revised the *Papilio* very carefully and speaks of our *Papilio* as *P. ægeus*, treating *P. erectheus* as a synonym. Kirby (1871), in his masterly catalogue, does the same, and more recently Rothschild (1895) concurred in this. Masters and Miskin, who in their catalogues in the main followed Kirby's Catalogue, depart from it in this instance and use the name *P. erectheus*, but assign no reason, nor have I been able to find any reason why the name *ægeus* should be used in Europe and the name *erectheus* in Australia. As the name *ægeus* appears first in Donovan's work, is that adopted by the three principal monographers who recognised the sexes as the same species, it is, I think, as well that we in Australia should fall into line and adopt the name *ægeus* for this species, as has already been done by quite a number of Entomologists here.

3 *Variation*.—In Australia the variation of this species is not at all great, as compared with its forms in New Guinea and the Bismark Archipelago. In our form it is mainly in the direction of the New Guinea sub-species, *ægeus ormenus*. In the male this variation consists of the white area in some specimens just entering the cell of the hindwing, and on the underside the reduction in number and size of the red spots. However, the anal red spot above is always present, and usually to a very marked degree.

In the female again the variation is all in the direction of the New Guinea form. Rothschild has pointed out that the only certain character to separate the females of *P. ægeus* and *P. ægeus ormenus* is that in the female of the latter the white area of the hindwing is never connected to the costa by a white bar as in *P. ægeus*. Quite a number of specimens of *P. ægeus* from all parts of Eastern Australia are without this white bar on the upperside, while in a single specimen only from Cape York this bar on the underside is reduced to a thin line. But by far the most important variation is the rare light-coloured form from Cape York, which agrees with the form named *amanga* from New Guinea. This white form has been erroneously recorded as *P. ormenus*, but differs from the white forms of that sub-species in exactly the same way as the ordinary forms do. Another most extraordinary aberration is that described by Mr. Olliff, and now in the Australian Museum. In this the red spots of the hindwing are very much lengthened. According to the only material to which I have access, namely, a figure of the larva of *P. ormenus*, that latter is considerably different from *P. ægeus*. This larva is figured as being a dark green, with much longer dorsal spines than in our form, while the lateral stripe is black. I have also seen figures of the early stages of the related Solomon Island forms, *woodfordi* and *bridgei*. The first, in both larval and pupal stages, presents many striking differences from our *P. ægeus*. The larva, excepting a pair at either end, is devoid of fleshy dorsal spines, is an almost uniform green colour, and reminds one rather of the type of larva of *P. sarpedon*. The pupa appears from the figure to be smoother than in *P. ægeus*, and also its dorsal surface bent at a greater angle. In the case of *P. bridgei*, the early stages here are much more like to those of *Papilio ægeus*. At first sight the figure of the larva might be taken for a variety of *P. ægeus*. The pupa, however, is much smoother and as figured is of a much lighter colour.

4. *Distribution*.—Considering for the moment all those closely related forms that have undoubtedly a common ancestry in the past ages, we find that the first species to be made known to science was *P. gambrisius* from Amboina, in the Southern Moluccas. Here again the dissimilarity of the sexes was the

reason of their being treated as distinct species by their describer, Cramer; then we have our species *P. ægeus* which, as I have stated, ranges in Australia from Cape York (where only in Australia the second form of female rarely occurs) to Sydney, and much less commonly to Victoria, where it has been taken in orchards in the northern portion of that State. On Darnley Island the New Guinea form *P. ormenus* occurs. This form was made known to science by the early French voyagers, and is a truly remarkable species. The male, which in its normal form is closely related to *P. ægeus*, has also two other forms, the most remarkable being that in which the subapical band of the forewing is quite absent, and the other in which the spots composing this band are very small. All these forms are taken in New Guinea, while the form with the small spots on the forewing appears to be the only one found in the Key Islands.

In the female we have distinct trimorphorism, the commoner form, especially on the mainland, is that which corresponds to the usual Australian female. However, a very white form also occurs; this was given the name *amanga* by Boisduval, and *onesimus* by Hewitson, under the supposition that they were dealing with a distinct species. This form occurs on the mainland of New Guinea, but appears to be more plentiful in the adjacent islands, several of my specimens coming from the Woodlark Islands.

This white form of female presents some striking resemblance to the only female form of *Papilio tydeus* from the Northern Moluccas. The white form of the New Guinea female is said to be a mimic of the genus *Tenaris*, a group of large slow-flying *Morphidæ* that are extremely common in New Guinea. At first this seems a very tempting theory, but one of the chief reasons against it is that where such mimicry occurs the mimicing species is usually much rarer than the mimicked. However, this light female form occurs as one of the two forms of *P. ægeus* on Cape York, though rarely, while the genus *Tenaris* is so far not known to occur here. It can scarcely have been overlooked, for during the last three or four years several keen collectors have spent a considerable time on the Cape York peninsula, and such a striking and easily caught group, which would be quite strange to most of these collectors, could hardly have been missed.

The third and much rarer form is that which approaches much nearer to the male in pattern. The forewing is marked with a white subapical bar like the male, and the large white area of the hindwing is only found on the upperside. I have this form from the Woodlark Islands, and Rothschild in 1895 supposed it to be confined to Waigiou, though the Tring Museum has probably received it from the New Guinea mainland since that date. In New Britain our present material

shows us that the male is monomorphic, while the female is dimorphic, having two forms, one of the type of the usual Australian *P. xergus*, and the other of the type of the male. In New Ireland a similar state of affairs exists, only the male and female are very different from those of New Britain. The Solomon Islands appear to be inhabited by two distinct sets of related forms agreeing with *P. hecateus*, in which the white band of the hindwing in the male extends along the costa to the base, or with *P. ptolycus*, in which this is not the case. In the far off Santa Cruz Islands a form, *P. oberon*, occurs. It is unfortunate that no system of nomenclature has yet been devised in which the relation to the probable ancestor is shown, the earliest described species being taken as the type of the group, whereas the more typical species is more often described later. Taking then, in the following remarks, all the subspecies as of specific value, and adopting the centrally situated species in New Guinea as our starting point, we find the distribution of our group as follows:—

P. ormenus, of New Guinea, is the most centrally situated species, and occupies in my opinion the approximate district in which this group originated. It has a dimorphic male, having either a subapical bar on the forewing or not (*othello*), while occasionally an intermediate form (*pandion*) is found. In the female we have trimorphism, the common form (*polydorinus*) allied to the Australian female, with its extreme light variation (*amanga*) and the rarer form of the pattern of the male. It appears as if the form *polydorinus* is the commoner on the mainland, while the other forms are found on the surrounding islands. In the Banda Islands we have a slight modification of *ormenus*, but up to the date of the publication of Rothschild's Monograph only one form of female was known. From the Key Islands we have another modification, *keianus*, of which the male is almost identical with the form *pandion* of the mainland, while two forms of female occur, the common one and its lighter derivative. In the Aru Islands and Darnley Island we have ordinary *ormenus* with its females *polydorinus* and *amanga*; in Australia *P. xergus*, but it is only at Cape York that two female forms occur, and it is here that our species shows a strong tendency towards *P. ormenus*. My collection contains this species from Thursday Island, Cape York, Cooktown, Cairns, Mackay, Richmond River and Sydney. I also have it from Lord Howe Island, where it does not appear to present any modification. It has not been recorded from Norfolk Island. To the westward of New Guinea we have a form *P. inopinatus* developed in Timor Laut and the neighbouring islands. It will be noticed that this western form has a tail-like structure like so many other species. It is quite possible that there is yet to be found in N.W. Australia a form allied to that in Timor Laut. In the Southern Moluccas we

have *P. gambrisius*, which in the male bears a strong resemblance on the underside to some Solomon Island forms. This also has only one female form. In the Northern Moluccas *P. tydeus* is found, whose single female is allied to the light *amangu* form of New Guinea. New Britain and New Ireland have each a single male and two female forms, but in each case the light form is wanting. In the Solomon Islands each large island as yet visited has been found to possess forms belonging to two groups according as the white area of the hindwing extends along the costa or not (*P. hecateus* and *P. ptolycus*); then further east we have the fine form, *P. oberon*, from Santa Cruz, which is closely allied to our own *P. ægeus*.

5. *New Guinea as a centre of dispersion, as exemplified by Papilio ægeus and Troides priamus.*—In considering the origin of a species it is not enough to take the central point of its present distribution.

The butterfly fauna of *Eastern Australia* may be divided into two groups of genera: First, those that decrease in the number of species as we range North, and these forms have no doubt entered our continent from the South; secondly, those genera that are almost entirely absent from the South, but increase in number of species as we proceed North, and further develop in New Guinea and the Malayan Islands. These species have reached us *via* Torres Straits.

The longer a species is in existence in a country the more likely it is to be found in a variable condition. This is amply borne out by the immense variation of *P. ægeus* in New Guinea, while this variation decreases as we proceed West, or South or East. Further, when we take species to the east and west of New Guinea we find a remarkable resemblance. For instance, the specimens of *P. gambrisius*, from Ambonia, and the form from Choiseul, in the Solomon Islands, show a very close resemblance on the underside, so that we are constrained to the view that these species represent somewhat corresponding points in the western and eastern spreading of this group of species. The Santa Cruz form at the extreme east is very close to the Australian form, and the Ugi species, *P. erskinei*, also on the east, shows a relation to *P. ægeus*. *P. inopinatus*, on the west, would also be instantly recognised as related to our species. Similar facts as these are shown in the cases of *P. agamemnon*, *P. ambrax* and *P. ulysses*.

As a further illustration of this, I have brought for exhibition this evening a selection of my sub-species of *Troides priamus*. The green-winged *Troides* obtain their maximum development in New Guinea, where beside the common *T. priamus* they are represented by *T. tithonus*, *T. goliath*, *T. chimera*, and the various forms of *T. paradisea*, none of which occur outside the limits of New Guinea. This immense

development can only be the result of long and continued occupation of that island, and it is particularly noticeable in the male, in which the shape, structure and pattern are variable, while in the females the pattern scheme is so very close that it required often a detailed structural examination to detect the species. In the case of the common and widely-distributed form, *T. priamus*, it is only in New Guinea and the surrounding islands, including a small area on Cape York, that the form with a central green bar in the male occurs, while outside this area to the west in the Moluccas, to the south in the Cairns and Richmond River forms, and to the east in the Bismark Archipelago and Solomon Islands this character is absent. The blue male is found to the eastward in the Bismarks and Solomons, and also in the Louisiades, which have only connection with the more northern islands through New Guinea. A blue-green form appears, according to Rippon, to be sometimes found in the Aru Islands. In dealing with the females we find a resemblance between those of *croesus* from the Northern Moluccas and *euphorion* from Cairns, while the forms to the west and east of New Guinea are much lighter in colour than those of the mainland. As a further argument that this group has come to us from New Guinea, I would point out the diminution in size in the form from Northern New South Wales.

I hope that these few facts that I have laid before you to-night, and which might have been illustrated with many other species, will cause a desire for the study of geographical distribution amongst many of my hearers. I do not desire to indicate that I am convinced that it has been conclusively proved that New Guinea is a point of origin and centre of dispersion of butterflies in the east, but I wish to draw attention to that probably being the case. It will be noticed that I say a point of origin. I believe other points of origin occur further west. I hope at some future date to extend my remarks on the New Guinea origin of some of our butterflies, and to deal generally with the origin of all our forms.

NOTES AND COMMENTS.

EGGS AND BREEDING HABITS OF FISHES.—The lecture which Mr. D. G. Stead delivered under the above heading at our June meeting, and of which an abstract was published in the July issue of this Journal, has now been issued in book form. This brochure adds another "Nature-Study" book to our literature, and will, we are sure, be welcomed by the teaching profession in this and neighbouring States. Of recent years nature-study has been added to the curriculum of our public schools.

and, sad to say, teachers have had little beyond European and American literature to help them. This, however, is now destined to be soon a thing of the past. It is for this reason that works on Australian fauna (when capably written and illustrated as this one under notice is) by our local leading authorities should, and no doubt will, receive that encouragement to which by merit they are entitled.

LIST OF MEMBERS ELECTED DURING THE YEAR, FROM
AUGUST 1st, 1906, TO JULY 31st, 1907.

Alexander, S., 16 Bond St., Sydney
 Buer, C. J., 49 Alexander St., North Sydney
 Booth, E. H., Mowbray Road, West Chatswood
 Booth, Dr. Mary, 171 Macquarie St., Sydney
 Bratnall, R. W., Australian Museum, Sydney
 Burgoyne G. P., Lang St., Mosman
 Cherry, H., Wahroonga, Sydney
 Cook, W., 61 Johnston St., Annandale
 Crouch, Miss, Metropolitan Rd., Enmore
 Donnelly, Master C., Public School, Dilga, *via* Cumnock, N.S.W.
 Donnelly, Master J. " "
 Donnelly, Miss J. " "
 Fox, A. G., Wilberoi, Boggabri, N.S.W.
 Fox, Mr. Esmond, Head Master Superior Public School, Enmore
 Froggatt, Lewis, Young St., Croydon
 Garnsev, H., Superior Public School, Enmore
 Grassick, — Bega, N.S.W.
 Johnston, T. Harvey, B.Sc., Technical College, Sydney
 Keane, J. H., 23 Tupper St., Marrickville
 Lockby, J. G., Killara
 McCulloch, A. R., Australian Museum, Sydney
 Miller, Miss M., Blackfriars College, Sydney
 Mitchell D., Prince Albert St., Mosman
 Morse, F. C., Bundy, Coonamble, N.S.W.
 Newling, Cecil, Cabramatta Road, Mosman
 Newton, Miss F., Public School, Mosman
 Norman, Rev. Philip, "The Manse," Scone
 Oschatz, A. L., 19 Victoria St., Darlinghurst
 Patterson, Master J., Public School, Dilga, N.S.W.
 Patterson, Miss L. " "
 Ralph, C. J., Public School, Bendenine, Bowning, N.S.W.
 Rayson, H., "Halycon," Railway Avenue, Stanmore
 Souef, A. S. Le, Director, Zoological Gardens, Sydney
 Stokes, Dr. E. S., Water and Sewerage Board, Sydney.
 Taylor, F., Technological Museum, Ultimo
 Taylor, T. Griffith, B.Sc., University, Sydney
 Tegel, Rudolf, 85 John St., Woollahra
 Thackeray, C., *c/o* Sydney Mail Office, Sydney.
 Tynan, Miss N., Australia St., Newtown
 Wilson, Miss J., "Apbeta," Nelson St., Woollahra
 Wood, Miss S. A., Public School, Singleton, N.S.W.
 Woollett, C. J., Experiment Farm, Wagga, N.S.W.
 Woolnough, Dr. W. G., Geological Department, University, Sydney.

THE
Australian Naturalist.

VOL. I.

JANUARY, 1908.

PART 9.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt Street on Thursday evening, October 3rd, 1907, the President, Mr. S. J. Johnston, B.A., B.Sc., in the chair.

LECTURE.—An interesting lecture, illustrated by lantern views and numerous specimens, on "Some Fossils in the Neighbourhood of Sydney," was delivered by Mr. W. S. Dun.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt Street on Thursday evening, November 7th, 1907, the President, Mr. S. J. Johnston, B.A., B.Sc., in the chair.

LECTURE.—Mr. T. Harvey Johnston, B.Sc., lectured on "Flukes and Tapeworms," tracing the development of the parasites through their various hosts, and illustrating his remarks by means of lantern slides.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt Street on Thursday evening, December 5th, 1907, Mr W. J. Rainbow, F.L.S., F.E.S., in the chair.

LECTURE.—Mr. Edwin Cheel read a highly interesting paper, "Notes on some Australian Lichens," and, in concluding, presented to the Club Library a copy of his manuscript catalogue of upwards of 2000 species of Lichens contained in the National Herbarium, together with bibliographies of the lichenology of Australia, New Zealand, and the Pacific Islands.

TASMANIAN MUSEUM.—Mr. Robert Hall, F.L.S., C.M.Z.S., who has been appointed to fill the position of Curator to the Tasmanian Museum, in the place of the late Mr. Alexander Morton, assumed the duties of his new office on January 1st. Mr. Hall goes to Tasmania with a good reputation, and the island State is to be congratulated on obtaining the services of so distinguished a naturalist. Mr. Hall occupied a position on the staff of the Queensland Museum at one time, but owing to a scheme of drastic retrenchment in all government departments in the Northern State, was compelled to retire. As a traveller and writer, Mr. Hall has achieved considerable celebrity. His visit to Kerguelen Island was most successful from a scientific standpoint, as was also his tour through Siberia. Among his principal literary productions are "A Key to the Birds of Australia," and "The Useful Birds of Southern Australia."

NOTES ON SOME AUSTRALIAN LICHENS.

(Abstract of a Paper by Mr. Edwin Cheel.)

THE proceedings or records of any Society whose objects are the study of nature, would not be complete without some reference to the thousands of plants classed under the family Lichenes, and which form a large part of the vegetable kingdom represented in Australasia. In the following notes I will endeavour to furnish some information which may be the means of inducing members of this Club to take an interest in this section of botany.

SITUATIONS IN WHICH LICHENS OCCUR.—Owing to the dryness of the climate, and the crumbling nature of the sandstone rocks, the lichen-flora in the neighbourhood of Sydney is not very rich; but although the individual plants are not very numerous, they yet comprise a considerable number of species. Even as far south as Eden, Twofold Bay, one meets with the same scarcity of specimens. On the rocks near the extreme coastline some specimens of the beautiful yellow or orange-coloured *Xanthoria parietina* and *Thelochistes chrysophthalma* var. *denudata* may be found. The first is a cosmopolitan species found almost everywhere in low land districts. When specimens are found growing on the trunks of trees, a slight difference in colour will be noted, the lichen being somewhat paler, a fact which has led some lichenologists to regard it as a variety. Other species than these may also be met with on rocks near the coast

Approaching a little further inland, where the Phanerogamic vegetation is thicker and affords a little shelter, the collector will find some fairly fine specimens of *Parnelia*, *Physcias*, &c., also growing on rocks. In the deep gorges and gullies at Waterfall and at Manly and Hawkesbury some very fine specimens of *Parnelia sticta* and *Parnaria* occur, as well as a number of the fruticulose kinds included in the genus *Cladonia*. The latter are usually found growing on the ground or mossy rocks. Specimens of other genera will also be noted on trunks of trees, rocks, and very plentifully on the shady sides of fences. The branches of *Casuarina*, and the trunks of *Syncarpia* and many of our wattles will yield the collector many beautiful specimens. On the Wianamatta shale series some fine specimens of *Cladonia racemosa*, *C. difflisa* and *Heterodea muelleri* occur. Occasionally large patches of *Heterodea* will be found growing on ant-hills. On fences in the open forests of Penshurst, Bankstown, and Parramatta are to be found some very large specimens of *Parnelia*, *Anzia*, and others.

Some species seem to be indifferent as to substrata, while others will be found on certain strata and nowhere else. Thus,

for example, *Thysanothecium hyalinum* is rarely found except on decaying stumps, usually those that have been charred, which it seems to prefer; *Cladonia bacillaris*, a beautiful scarlet-fruited species is always found growing on decaying logs buried in the ground, but with their surface just exposed. Mountainous country, with high ranges of hills, rocky precipices and tortuous ravines offer the greatest number of forms or species. In this class of country lichens seem to attain their maximum development in the form of large foliaceous *Stictis* and *Parnelias*. Some of the former attain a diameter of eighteen inches and upwards.

It is interesting to note that lichens collected in the deep gorges or ravines of Mt. Victoria, Mt. Wilson, Belmore Falls, near Bowral, Mt. Kosciusko, and in some parts of New England (N.S.W.), have much in common with the Lichen-flora of Mt. Hotham and Mt. Macedon in Victoria, Mt. Wellington in Tasmania, and Ben Lomond in New Zealand.

COLLECTING AND PRESERVING OF LICHENS.—This is a comparatively easy matter, and one that demands no cumbrous or expensive apparatus: an old knife, a hammer and chisel, a few shallow boxes (match boxes will do), a good supply of newspaper, and a tin box or bag are all that is required in the field. Lichens may be collected all the year round. Some of the larger foliaceous or fruticulose forms will be found growing on the bark of many trees, wooden fences, decaying wood, stones or rocks, old rags, leather and broken glass, and on the soil. Often as many as fifteen species may be found on the bark of a single tree. If the Lichen is growing on the trunk or branch of a tree, it will be necessary to take a piece of the bark with it; if on the ground a thin-bladed knife will remove it free of soil, but often a portion of the latter is better taken with the plant, as it aids in keeping the specimen together; if on rock, and it cannot be removed with a knife without breaking the plant too much, a piece of the stone must be chipped off; if growing on loose stones in the beds of creeks or the like, the whole thing may be collected.

I find that pieces of newspaper cut into various sizes are best for collecting purposes. These may be made into quadrangular "pockets." To make a pocket, bring the sheet up to within about one inch of the top and then turn it down and crease it; next turn the top inch down and crease that also, and then fold back about an inch on either end. If the unprinted margin of the paper is brought to the top when making the pocket, rough field notes can be made thereon. These pockets are much better than paper bags, because specimens can be examined without being removed, and with less risk of damage.

Some of the larger foliaceous forms will require a little pressure until dry, and this can be done while still in the

newspaper pockets. When the plants are thoroughly dry, a sufficient amount of the plant, together with the fruit, should be placed in pockets of strong white paper, made in the same way as indicated above, or what is even better, by gluing or fastening the specimen on a sheet of clean white paper.

The size and shape of the specimen will determine the size and shape of the pocket or paper, which should then be pinned to herbarium sheets of uniform size. Time and place of collecting should be indicated on the pocket or sheet on which the specimen is fastened, or on suitable labels printed for each locality where much collecting is done.

If it is desired to send a collection of specimens to specialists for determination, it is a good plan to number the pockets or sheets on which specimens are fastened, provided always that each duplicate specimen receives the corresponding number. The name when supplied can then be added.

USES OF LICHENS.—Lichens, like some species of Ferns and Fungi, have a positive advantage over Mosses and Hepatics, in that they are, in many cases, highly valuable economically. *Cladonia rangiferina* supplies food to the reindeer of Lapland, hence it is popularly known as the "Reindeer Moss." It covers vast tracks of country in the colder regions in nearly every part of the world. Tasmania and some parts of New Zealand have furnished a number of specimens of this scrubby little lichen and its forms, but it has not, so far as I can gather, been used to any great extent in this part of the world. "Iceland Moss," *Cetruria islandica*, is kept in most of our druggists' shops, as it is used largely in medicines. The lichen is common in Iceland and the northern and mountainous parts of the United States. It is held in great repute on account of its medicinal properties in pulmonary affections. It is extremely mucilaginous, bitter to the taste, and somewhat astringent. Icelanders convert it into a tolerably pleasant food by drying it, and then boiling it in water. A soup is also made from it. "The Gardeners' Chronicle" (Series 3, Vol. xxiv., 1898, p. 179), recommended it as one of the best materials for planting in shady court-yards and under trees where no direct sunlight penetrates. It is said to have a good effect when in contrast with turf and gravel.

Several species of the genus *Roccella*, commonly known as "Orchella-weed," are of immense value on account of their fine colouring matter. Litmus, that beautiful, deep violet-blue, so useful to chemists as a test for acids, is perhaps the best. It is prepared chiefly from *R. tinctoria*. *Lecanora esculenta*, which rolls in a detached state, abundantly on the sandy plains of Africa, is collected as food for man and beast. Numerous articles have been written on this species, some authors asserting its identity with the manna supplied to the children of Israel whilst journeying through the wilderness.

Many arctic voyagers have prolonged and saved their lives by the use of species of the genus *Gyrophora*. The species of this genus are found on rocks projecting through the snowy or Alpine regions in nearly every part of the world. Several species have been found on Mt. Kosciuszko in N.S. Wales, Mt. Hotham in Victoria, Mt. Wellington in Tasmania, and Ben Lomond in New Zealand. *G. (Urnulicaria) cylindrica* is perhaps the commonest species of this genus found in the above localities. A note by the Rev. F. R. M. Wilson attached to this species in the National Herbarium, Sydney, mentions the occasional use of this species as food, but more frequently for dyeing woollen cloth of a brownish-green colour. *Usnea longissima* is stated by F. M. Bailey (Proc. Roy. Soc. Tasm., 1880, p. 34), to be extensively used in Queensland, entwined round the hat as a protection against the sun. Upwards of thirty species and varieties of this genus occur in Australasia. They are very common on fences and trunks of trees in some parts of our forests and open country. The genus is widely distributed all over the world, and the species are generally known as "Old Man's Beard," or "Tree Moss." Branches adorned with these plants are in great demand by taxidermists, who utilise them in setting up their mounts. Various other uses have been made of these lichens; they are in considerable demand in the art of perfumery, owing to their aptitude to imbibe and retain odours.

LICHENS AS A GUIDE TO HEALTH RESORTS.—On the Lichen-flora as a guide to health resorts, much may be learned through a study of their general habits. Localities in and around most of our cities are almost destitute of lichenose vegetation, as they do not love places not open to salubrious air. Crombie, in "Grevillea," ii. (1874), p. 145, has observed that not a single lichen, nor scarcely even the trace of any *thallus* are to be found in any of the public parks of London. Those in search of health resorts might, to some extent, be guided by the silent testimony of these plants growing so abundantly in some of our healthiest districts.

THE MANTIS.

(Abstract of Paper by Mrs. L. Ross, read before the Armidale Branch, June, 1907.)

THIS is a common insect here, and most people know it. The name Mantis is derived from the Greek, and means prayer. It has been termed "Praying Mantis," on account of the peculiar devotion-like attitude it assumes when at rest or awaiting prey. I think it was the Ancient Romans who called these insects "Soothsayers" and "Prophets." The Hottentots worshipped them as tutelary divinities.

The Mantis belongs to the order Orthoptera, a group that embraces in addition the "Leaf" and "Stick" insects, more popularly known in Australia as "Native Ladies."

The particular Mantis to which I refer is known to naturalists as *Orthodera ministralis*. It is usually of a green colour, but some specimens are yellowish and some brown. The fore-legs are raptorial and are used by the insects in capturing prey. They are barbed all along the under-side, so that when a victim is grasped it has no chance of escape. On the inner-side of each fore-leg there is a spot of beautiful dark blue-black within a circle of cobalt. These are considered by naturalists to be organs of hearing. The other legs are slender and are used for walking. Whatever the colour of one of these insects may be, it always harmonises with its surroundings. I have often plucked a flower, and have not noticed the Mantis upon the stem until it moved. I have found endless amusement in watching these insects catch and devour their prey. One day I watched one catch a large blowfly; it started to eat the head, then the thorax to the wings, eating the latter as far as the veins extended, and then letting the remainder fall; then to the abdomen which was well charged with live larvæ wriggling about, but not one escaped. When the meal was finished, the Mantis cleaned itself carefully, drawing its feet through its mouth, then rubbing its face and wings down, and when it was quite satisfied that there was no trace of fly left, it again assumed the devotional attitude in anticipation of more to eat, for that fly had but taken the edge off its appetite.

I was much amused one day when watching a Mantis upon a rose. Another one appeared upon the scene and tried to take its place upon the same flower, but the one in possession disputed it and they had a battle royal. Their fore-legs flew out like lightning—thrust and parry, parry and thrust. It was an exciting contest and lasted for some time, until at length worsted in the contest one of the combatants retired. Had it not done so it would probably have been eaten. I have read somewhere that this is what usually takes place.

The Mantis does not pass through metamorphoses as do the majority of insects, like butterflies, moths and beetles, for instance. On the contrary, when it is first hatched out, it closely resembles its parents. But if it does not undergo metamorphosis, it has at any rate to pass through a series of moults before it becomes an adult. Each moult is rendered necessary by the fact that as the insect grows the outer skin fails to keep pace, and so becomes too tight. As the skin splits and the animal withdraws, the old coat is discarded. When it first escapes from the old skin the creature is soft and limp, and easily injured, but it soon becomes hard and sturdy and fitted for life's battle. In the Autumn the female Mantis lays her eggs. She knows that it would be useless to deposit them

upon that perishable rose or those green leaves, where she has made her abode all the Summer. She is far too wise for that, as the eggs will not be hatched until the following Summer, and the Winter frosts would perish all flowers and leaves. She accordingly flies to a bush which has plenty of old brown stems upon it, which she selects, knowing that it will just match her egg-case. The egg-case or capsule is composed of a brown, sticky secretion which soon hardens on exposure to the air. It is constructed of numerous cells in which the eggs are deposited, and looks just like a knot upon the stem. Thus protected all through the Winter the eggs remain until the warm November sun calls the little Mantids forth to life and energy. Pretty, lively little fellows they are, too—green with a dark stripe running down the middle. Though little, they are ravenous, but there is plenty of food in the shape of minute insects which are altogether too small to appeal to the taste of their parents.

I don't think the Mantis is particular as to what kind of food it gets. One day I found one eating a large ant, of which, judging by the odour, the flavour must be pretty strong. The Mantis is among our allies. I counted the cells in an empty egg-case and there were twenty-one, but that does not mean that there had only been twenty-one eggs: there may be more than one egg in each cell.

I have noticed in this district a species larger than *Orthodera ministralis*, and with longer and more densely spined fore-legs. I have never seen this, however, except in gardens and orchards. I notice in Mr. Froggatt's "Australian Insects," that Westwood describes, in 1889, 624 species of Mantis, of which only 30 are from Australia, and Kirby, in 1904, brings the list to 843, and adds five more to our list.

REVIEW.

"A GUIDE TO THE STUDY OF AUSTRALIAN BUTTERFLIES."—By
W. J. Rainbow, F.L.S.; Melbourne, T. C. Lothian, 1907.

THE issue of this work is opportune and will meet the requirements of the numerous students of entomology in Australia who are now turning their attention to the charming group of which it treats. The book is meant especially for beginners, for whom it is admirably suited, but it will also be acceptable to more advanced entomologists.

In the two opening chapters we have a general introduction to the life-history of butterflies in general, and of the methods of capture and preservation, written in a clear and interesting manner. The remainder of the book is devoted to details of the life-history of numerous representative species. Here there is presented a mass of original work, based on careful observation

by the author, which is a very creditable addition to our knowledge of the group. The work is copiously illustrated from original drawings and photographs, but the illustrations are of varying merit, many of the wood-cuts being rough and wanting in clearness. These, however, are but trifling blemishes to a most excellent work. Plate 1, representing the larva of *Danaus menippe* is perhaps the best, and makes a very pleasing picture.

There is a useful appendix of technical terms and a comprehensive index.

THOS. STEEL.

NOTES AND COMMENTS.

BEGA BRANCH, N.S.W. NATURALISTS' CLUB.—A branch of this Club has been established at Bega, and the following is a list of its members:—Misses Julian, District School, Bega, Curios; Mangan, Public School, Kameruka, Timbers; Smith, District School, Bega, Nature Study; Messrs. Grassick, District School, Bega, Entomology; Gould, Public School, Toothdale, Pests and Parasites, Minerals; Main, District School, Bega, Lepidoptera; Fitzell, Public School, Candelo, Minerals; Cahill, Public School, Tantawanglo, Natural History; Byron, Public School, Tanja, Coleoptera; McDonald, Ornithology.

FROM RANGE TO SEA.—Mr. T. C. Lothian, of Melbourne, has just published a charming booklet under the above title. It consists of a series of nature-study chapters, chiefly on bird-life, by that excellent penman and naturalist, Mr. Chas. Barrett. The illustrations, principally from photographs by Mr. A. H. E. Mattingley, are exquisite. Both author, photographic artist, publisher and printer are to be congratulated on the excellence of this publication, which should find its way into the library of every Australian Naturalist. The literary matter is both bright, simple and interesting, and we quite agree with the author in his remarks respecting the superiority for study of the living bird in its natural surroundings, over that of the average abominations in the shape of bundles of feathers, that frequently find their way from the workshops of some so-called taxidermists, many of whom really do not know how to set a bird or a mammal.

A NEW LIEBERKUHN.—Mr. M. J. Allen, "Alata," Victoria Parade, East Geelong, of the Geelong Field Naturalists' Club, has devised an improved form of Lieberkuhn for illuminating opaque objects when under examination with the microscope, which is reported to be of great utility. He is anxious to place it in the hands of every working microscopist, and will be pleased to forward details to any person desiring information on the subject.

BUTTERFLIES AND APHIDES.—It is a well-known fact that the larvæ of many species of butterflies (Lycinidæ) fraternise with ants, and also that many of the latter keep, systematically, aphides for the purpose of milking them of a sweetish substance or "honey-dew." In "The Fauna of British India, including Ceylon and Burma," Butterflies, Vol. II., an interesting observation by Col. H. J. W. Barrow is recorded, namely, a Lycinid (*Allotinus horsfieldii*) "milking" an aphid in the same manner as if the butterfly had been an ant. A figure is given on page 287 of the work quoted, of the butterfly in the act of milking.

MR. W. W. FROGGATT.—Members of the Club will be pleased to note, by occasional references in the daily press, that our old friend and comrade is progressing well on his travels. Since leaving Sydney he has seen much of the world, and has amassed a vast amount of information that should, and doubtless will, be of immense value to every State in the Commonwealth. As a keen observer, Mr. Froggatt is well-known throughout New South Wales, and his reports that have been published respecting his visits to Hawaiian Islands and various centres in the United States, furnish much interesting information.

A NEW RUBBER TREE.—Rubber has of late years entered so largely into common use, that fears have been entertained that the time is approaching when the output will fail to meet the demand. It is interesting, therefore, to note that a new rubber-producing tree, belonging to the same natural order as *Hevea brasiliensis* and *Manihot glaziovii* is reported from Mexico, to which the name *Palo amarillo* has been given. This tree is reported as thriving well on rocky soil, and occurs in several States of Mexico at a height of 1,500 to 1,900 metres, where the temperature varies from 62.5° to 68° F. The latex of *P. amarillo* is yellowish and white, thin, and does not coagulate readily. A yield of 1.75 pints per tree was obtained in recent experimental tappings. It is expected that the trees will stand three tappings per annum for ten years. The latex contains a large proportion of resin, this being reported as 40 per cent., and the amount of rubber present as 18 to 20 per cent. It is stated, however, that a process has recently been devised for separating the two substances, with the result that rubber of good quality has been obtained, while the resin yielded an excellent varnish. The value of the rubber is estimated at 4s. per lb., and the resin at 1s. 6d. per lb.

THE PEANUT.—The ground or peanut *Arachis hypogæa* shows some striking differences compared with other members of the Leguminosæ, more especially in the interesting formation of underground fruits. The pods of most of our common leguminous plants break open at maturity. This is not the

case with the peanut. After fertilisation has been effected, the yellow petals of the blossom drop off, the flower stalk elongates and bends over, and as a result, the tip of the stalk, together with the remaining portions of the flower, is buried in the soil. If the stem fails to reach the ground no pod is formed, but once the tip of the stalk finds its way into the soil, the pod develops rapidly. The peanut is therefore an underground legume—hence its specific name *hypogæa* (under the earth).

BIRD NOTES.—The droughty conditions prevailing brought down breeding flocks of the two Wood Swallows, *Artamus superciliosus* and *A. personatus*, to the coast, though in smaller numbers than is usually the case. These birds visited Sydney in 1905, and also in 1902. They are valuable insectivorous birds, and, in spite of the evil reputation which clings to them because they devour a few bees, should be rigorously protected. On 13th October last, while out at Manly with Miss Mack and my brother, a nest of the White-shafted Fantail, *Rhipidura albiscapa*, was taken, containing two eggs of the Fantail, and in addition the very much larger creamy egg of the Pallid Cuckoo (*Cuculus pallidus*). This Fantail has not, as far as I have been able to ascertain, been previously recorded as a host for the Pallid Cuckoo, though I have heard indirectly that some Melbourne friends took a similar clutch in 1906. The honour of actually discovering the nest belongs to Miss Mack. On 28th September, 1906, I took a clutch of the Spine-billed Honeyeater (*Acanthorhynchus tenuirostris*) at Flemington. The nest also contained an egg of the Bronze Cuckoo (*Chalcococcyx plagiatus*). This also constitutes a record, and is especially interesting as the egg of this Cuckoo is so rarely placed in an open nest.—L. HARRISON.

SCIENTIFIC EXPEDITION.—The expedition to the Auckland and Campbell Islands has been most successfully accomplished, and whilst it is, at present, too early to speculate as to ultimate results, there can be little doubt but that much valuable information has been gained. Indeed, considering the *personnel* of the party, this is only what was anticipated from the start. The party was a strong one, and, in order to accomplish as much as possible in the time at its disposal, it was divided into two sections, one of which explored the Auckland Islands, and the other, Campbell Islands. That of the first-named islands included Dr. Farr and Mr. H. D. Cook, magnetic observers; Professor Benham, and our old friend and member, Mr. E. R. Waite, zoologists; Mr. Hudson, entomologist; Dr. L. Cockayne, Messrs. J. S. Tennant and Aston, and Captain Dorrien-Smith, botanists; Messrs. Speight and Finlayson, geologists. The Campbell Islands contingent included Messrs. Skey and Kidson, magnetic observers; Dr. Chilton, Professor Kirk and Mr. J. B. Mayne, zoologists; Messrs. R. M. Laing and J. Crosby Smith,

botanists; Dr. P. Marshall and Mr. E. Browne, geologists. These sub-antarctic islands are, naturally, out of the ordinary course of trading ships, and are seldom visited, consequently little has been known of their fauna, flora, and geology. Unfortunately, the time spent upon the islands was all too short—only six days; nevertheless, all worked hard, each in his own special line, and this under trying climatic conditions—gales, rain and sleet. The zoologists found the fauna of Auckland Islands much richer than their colleagues had found that of Campbell Islands. Mr. Hudson obtained a considerable collection of insects, and as the entomology of the Auckland Islands is practically unknown, they are sure to be of much interest to science, and many of them will probably prove to be new. The geologists made the interesting discovery of marked signs of ancient glaciation, and, further, that the island showed distinct evidence of having at one time belonged to a larger land area. The botanists climbed to the top of Adams' Island, the more southern of the two larger islands, and although not many new plants were discovered, a number of important and interesting plant formations were noted. The magnetic observations made were, happily, very thorough and complete. The sensational experience of the trip was the discovery of cast-aways from the wreck of the ill-fated ship *Dundonald*, the account of which has appeared in the columns of the daily press.

SUB-ANTARCTIC TREE FERNS—On a previous trip of the New Zealand Government s.s. *Hinemoa* to the Auckland Islands, a fragment of the frond of a tree fern—*Hemitelia smithii*—was obtained, but no botanists had ever seen the plant growing. Naturally, when the Scientific Expedition referred to above, visited the Auckland Islands, the members were anxious to see these, the most southernmost tree ferns in the world. Accordingly a party went ashore at Norman's Inlet, Auckland Island, where they found, on entering the forest, the tree ferns growing in abundance. If there had been any doubt before as to the existence of this plant in these southern latitudes, this remarkable habitat now received ample confirmation.

THE ANTARCTIC EXPEDITION.—This expedition, which is about to sail from New Zealand, under that gallant and experienced South Polar Explorer, Lieut. Shackelton, R.N., is one that will doubtless prove of vast importance to Australia—how important it is not possible at present to determine. For this reason, and also for the fact that some well-known Australian scientists are accompanying it, its welfare, success and adventures will be keenly watched. When leaving Sydney the other day, *en route* to Dunedin, where they will join the *Nimrod*, Professor David and his party were given a great send-off. Whatever may be the scientific results of the expedition, and they should be considerable, members of the Naturalists' Club of N.S.W., will, we are sure, unite in wishing

all connected with the *personnel* of the expedition, not only *bon voyage*, but a safe return.

EXTERMINATION OF ANIMAL LIFE.—In the November number of *The Zoologist*, Mr. W. L. Distant discusses under "Biological Suggestions," the extermination of animal life by human agency. In the course of a most interesting paper, the distinguished naturalist refers to the work of destruction that has been going on in Australia for some time, and, as a matter of fact, is still going on. In some instances, of course, the destruction of native or introduced animals may be justifiable, but often, alas, it is both wanton and wicked. Carl Lumboltz tells us that at Peak Downs, Queensland, one of the sheep-owners had informed him that in the course of eighteen months he had killed no less than 64,000 marsupials, especially Wallabies—*Macropus dorsalis*, and Kangaroo-rats—*Lagorchestes conspicillatus*, and also many thousands of the large Kangaroo—*Macropus giganteus*. "What animal life," asks the author, "can long withstand such wholesale massacres? The discoveries of Tasman, Dampier, and Cook will result in the total extinction of more than one human race, and in the partial extermination of a singular land fauna belonging to a mighty island-continent. The Kangaroo will follow the Aborigine, and both in time become parts of a story to be told, an incident in the battle of human civilisation." Dr. Ramsay, writing of the Cassowary (*Casuarinus australis*) in 1876, said it was tolerably plentiful only a few years before in the neighbourhood of Cardwell, but since the advent of sugar planters on the Herbert River and adjacent creeks, these fine birds had been most ruthlessly shot down and destroyed, merely for the sake of their skins. Speaking of the Lyre bird, Mr. Aflalo says that two enterprising brothers employed a number of men to shoot the luckless male birds, in which, after some practice, they were unfortunately so successful that five hundred dozen of the beautiful tails were reported to have reached Sydney in the course of a few weeks. The Government of New South Wales in 1891, according to Coghlan (*Wealth and Progress*) spent no less than £50,000 for the destruction of 871 Emus, over 1,000,000 Marsupials, 65,000 Hares and Rabbits, 11,530 Dingoes, and 3,502 Eagle Hawks. Think of it! In 1888 upwards of 10,000 Emus were destroyed in one district alone, while in the same period no less than 1,500 of their eggs were broken on one estate.

EXPEDITION TO THE KERMEDEC ISLANDS.—A small expedition to these islands was to have left New Zealand in December. It was to consist of five young enthusiastic men, who had arranged to spend twelve months on these uninhabited islands, collecting, observing, and photographing. It is hoped that the results of the expedition will be worked out by New Zealand naturalists.

THE
Australian Naturalist.

VOL. I.

APRIL, 1908.

PART 10.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held in the Board Room, 82 Pitt Street, on Thursday evening, February 6th, 1908, Mr. D. G. Stead, Vice-President, in the chair.

PAPER.—Mr. W. J. Rainbow, F.L.S., F.E.S., read an interesting paper—"Notes on Some Aquatic Insects," in which he traced the evolution of aquatic forms from terrestrial insects. The paper was illustrated by numerous diagrams and specimens.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held in the Board Room, 82 Pitt Street, on Thursday evening, March 5th, 1908, the President, Mr. S. J. Johnston, B.A., B.Sc., in the chair.

NOMINATIONS.—Messrs. G. H. Johnson, Wiseman, and Moreau were nominated for membership.

PAPER.—Mr. A. F. Basset Hull read a paper on "Chitons and Chiton Collecting," illustrating his remarks with a very fine series of specimens, comprising all the varieties recorded on the New South Wales coast between La Perouse and Barrenjoey.

CHITONS.

(Paper by Mr. A. F. Basset Hull).

It is not my intention to enter upon a learned and scientific disquisition upon the Polyplacophora, or many plate bearers, partly because to do so would occupy almost as many nights as the Arabian Nights entertainments, and also because I am not qualified to do more than give you a brief sketch of the Port Jackson Chitons, and a few hints which may enable you to reap some of the abundant rewards that have resulted from my two years' study of these shells in their native haunts.

The order Polyplacophora embraces the majority of the multivalve mollusks; the shells of this order consist normally of eight plates or valves, more or less overlapping, bound together by a leathery girdle. The valves may be easily separated by boiling in a weak solution of caustic soda, and when thus disarticulated, the valves will be seen to be of three

forms—the anterior, or head valve, semicircular in form with elevated apex; the six median valves, all bilobed and similar in shape; and the posterior, or tail valve, which is like the median valves, with the addition of a sloping surface behind the apex or mucro.

The surface of the valves of most Chitons is divided into more or less clearly-defined areas, adorned with the marvellously diversified sculpture forming the principal characters by which the various species may be determined. Each side of the median valves is generally divided by a diagonal line into what are termed the lateral and central areas, and a dorsal or jugal tract extends along the ridge of the valve. As a rule the anterior valve is sculptured all over like the lateral areas. The posterior valve is divided into a central and a posterior area. The interior of the valves also offers distinctive characters for the determination of species in the projecting plates, called insertion plates, to which the girdle is attached. These are commonly cut into teeth by transverse slits, varying in number with the different species.

The girdle is variously clothed with scales, spines, hairs or spicules, varying greatly in development among closely allied species.

So far as the Polyplacophora found on the New South Wales coast are concerned, the following genera are represented:—*Chiton*, *Ischnochiton*, *Callochiton*, *Callistochiton*, *Onithochiton*, *Tonicia*, *Lorica*, *Loricella*, *Plaxiphora*, *Liolophura*, *Acanthochites*, *Cryptoplax*, *Iepidopleurus*.

These are given in inverse order of development—the highest forms first.

They are found at different stations or depths below high-water mark. Some species cling to the outer surface of the rocks, others affect the under surface of large boulders, stones, or pebbles, while others cluster along the edge of insertion where the stones are half buried in sand.

To the first class belong *Chiton pellisserpentis*, *Plaxiphora petholata*, *Liolophura gaimardi* and *Onithochiton rugulosus*. These four species, owing doubtless to their exposed stations, and the fact that they lie between high-water mark and half-tide mark, are the commonest and most frequently found in collections.

In shallow water below low-water mark, and in the deep rock pools, most of the other species are found, the numerous and variously coloured *Ischnochitons* being generally within reach of the ordinary wader who is too lazy or has not the proper equipment for deeper water searching. Here also are found the handsome *Chiton jugosus*, *Onithochiton quercinus*, *Callochiton platessa*, and *Callistochiton antiquus* with its remarkable sculpture.

In deeper water, requiring the collector to strip and work in three or four feet of water, are found the rarer species, *Chiton coxi*, *C. limans*, *Lorica volvox*, and *Loricella angasi*.

Some species are consistent in colouring, while others vary infinitely in colour and diversity of marking. I am inclined to divide the colouring into four classes:—(1) Specific, that is common to all individual members of a species: This is exemplified in the constant alternate lines of blue and orange-brown in the central areas of *Chiton jugosus*, the blue freckling of *Ischnochiton lentiginosus*, and the olive-black of *I. australis*. (2) Sub-specific, that is permanent in the individual, but not common to all members of the species—for instance, white dorsal stripe, and red, black, blue, brown or green sides of *Ischnochiton crispus*; the wavy lines in black, pink, or purple of the sub-species known as *decoratus*; the coloured dorsal stripe and variegated radiating lines of *I. smaragdinus* sub-species *picturatus*, &c. (3) Protective, that is assumed more or less temporarily in order to assimilate the shell with its immediate surroundings: This is most marked in *Callochiton platessa*, which assumes a wonderful range of shades from grey-green to brilliant red, but which fade out almost completely when the animal is removed, and the shell becomes almost uniformly brownish. In spirit this protective colour is soluble and suffuses the shell. (4) Absorbed or stained: This is generally the result of environment, but is not consciously adopted for protection. Shells found adhering to ironstone or sandstone impregnated with iron are often changed to reddish brown, orange and yellow, and where an old rusty tin has been lying in a Chiton haunted pool, many of the shells are richly coloured with yellow and orange markings. This is merely a suggestion for a more careful study of the colouration of Chitons, which will require close observation and chemical tests, before any satisfactory classification can be arrived at.

The pursuit of the wily Chiton in its native lair is one of the most fascinating and exhilarating pastimes. Clad in a bathing suit and a pair of old boots, armed with a short crow-bar and many slips of wood, with plenty of string to tie down the shells, one can spend the three hours of low-water in the most profitable and interesting manner. Owing to the habit of the animal to curl up after removal from his rock, he must be promptly clapped on a flat stick, his girdle spread out by slipping a thin knife-blade under it, and he must then be tied securely down until the time comes to remove him. When the animal is taken out and the shell wiped clean, it must be again tied down, and left to dry for at least 24 hours. It should be painted over on the inside with a 2 per cent. solution of corrosive sublimate as a preservative, and is then ready for the cabinet. If spirit specimens are desired, the slips of wood, with shells tied thereon, may be put in the spirit bottle

for a little while, and when "fatally dead" the shells may be removed from the sticks and replaced in the spirit. They will not curl up again.

The best localities to search in for Chitons are the sheltered rocky corners of ocean bays, low-lying reefs with scattered boulders, and the deep rockpools containing loose stones. Land-locked bays, muddy inlets, and river mouths are not favourable localities.

PRESERVATION OF MARINE ANIMALS WITH THEIR NATURAL COLOURS.

As so many members of the Club pursue the study of our native marine fauna, the following abstract from a paper by H. C. Sorby, LL.D., F.R.S. (*Museum Journal*, January, 1908), may prove not only of much interest, but useful:—

Since it seems to me that it would be such a great advantage to be able to exhibit brightly coloured animals in all their natural beauty, and not more or less bleached, I devoted many years to experiments when living on my yacht, and so was able to obtain fresh material. Not being able to do this now, it may be useful to describe the general conclusions to which I have been led, and those cases in which I have been more or less successful. I may say that I have been able to preserve a number of our most highly-coloured animals for years without any apparent change.

Numerous experiments showed that the liquid in which the animals are kept must fulfil the following conditions:—It must not be too dear, must be colourless, antiseptic, and not dissolve the pigment or the oxygen of the atmosphere, and strong light must be excluded.

Considering now certain colourless, antiseptic liquids, I may say that in the case of many highly-coloured animals, the pigment is so rapidly dissolved by alcohol that in a few days they are almost colourless. Though diluted formalin may not dissolve the pigment, it may soon cause it to fade, owing either to its own action or to that of dissolved oxygen. Paraffin oil, such as is used in lamps, seemed to promise well, but the colour of the animals was soon lost. The only liquids which so far have been satisfactory are very strong glycerine and syrup. Against the former I have met with great prejudice, which is easily explained by the presence of water. Some years ago what was sold was probably far from being anhydrous, and the animals may have been put in in their natural condition, in which case the water they contained would have been quite sufficient to dilute the glycerine and so make it useless, since it does not require much to cause decay. On the contrary, if all the water be quickly removed and the animal finally put up in almost anhydrous glycerine, it may keep perfectly well, with its natural

colours, for years; but it may, perhaps, gradually fade from the extreme top downwards, because even strong glycerine dissolves a small quantity of the oxygen of the air. In glycerine some animals contract considerably, but usually only so as to look like smaller individuals; some become darker and alter in colour, especially Crustaceans, different individuals varying much. These changes can to a large extent be counteracted by previous treatment with 4 per cent. formalin.

Most of my experiments were with *Solaster papposus*, because it was far the most brilliantly coloured animal I could procure. Seeing that the upper portion of those rays which were within a short distance of the air enclosed in the glass vessel gradually faded, whilst the rest were unchanged, I kept a specimen in very strong glycerine, at the top of which was a thick layer of almond oil. After more than five years it is even now more brilliantly coloured than when alive, and there is nothing to indicate that it would not keep much longer. I also find that portions of *Solaster* have kept well in wide-mouthed bottles, with little air, probably because the external air has been well excluded. The question is, however, whether preparations with a layer of oil would be suitable since, if carelessly handled, the oil might come into contact with the animal and dissolve the colour.

Some animals, mounted as I have described in glycerine, look, after seven or more years, as life-like as those seen in aquaria, and this is surely worth the extra time and trouble to ensure that all the natural water has been removed.

Quite a number, however, differ from living specimens in showing more colour, because they are made more transparent. This disadvantage is more than compensated by the internal structure being made visible, and the general beauty increased. Of these I may specially mention *Ophiura*, *Cirratulus* and many other worms, which show well the leading blood vessels. Small plaice, soles, and skates show well the general colour, and also much of the internal structure and leading blood vessels.

In confirmation I may say I have some hundreds of marine animals dried, and then mounted in Canada balsam as lantern slides, and this has so well protected them from atmospheric oxygen that few, if any, have faded in fifteen years. As an almost universal rule these preparations have improved by keeping, having become more transparent.

The importance of the exclusion of oxygen is also proved by experiments with solutions of vegetable colouring matters, which have apparently remained unchanged for about thirty years when sealed up in glass tubes, almost absolutely free from air, even resisting for a considerable time the action of strong sunlight, though they soon faded when exposed to the air.

As an example of animals that I have been able to preserve for five years with their natural colour almost unchanged, I

may mention *Medusæ*, *Actiniæ*, various worms, some Crustaceans and Nudibranchs, *Sepia*, *Sepiola*, *Loligo*, various simple and compound Ascidians, Red Gurnard, and other fishes.

Taking the above facts into consideration, it seems that well-stoppered, wide-mouthed bottles, well filled and never opened, are fairly satisfactory. The preservation of colours is manifestly a chemical question, and now that the cause of fading seems to be known, there is more chance of preventing it, though it may be difficult to do what is requisite. Of course from the beginning I thought that exposure to strong light would make many specimens fade, and I, therefore, kept my chief preparations in the dark, except when under examination. I had a special series made up and protected as well as possible from the air, and others exposed to it; both were kept in the brightest available sunlight, and a comparison series was kept nearly in the dark. In nearly all cases the animals in alcohol or 4 per cent. formalin became almost colourless long before those in glycerine showed any sign of fading; but I was surprised to find that when in glycerine and exposed to strong light some animals turned dark or altered much in colour. In some cases one constituent colouring matter faded and another in the same animal did not, thus, as it were, changing one natural-coloured variety into another.

In these experiments my aim was to expose to as strong light as available. If such specimens were kept in a museum, and exposed to as little light as practicable, there seems no reason why the colour should not remain good much longer. Possibly, some liquid could be found better than glycerine, but this could only be learned by experiments taking a long time.

Since, according to old authorities, what was thought to be a young Centaur was sent from Egypt to the Emperor Augustus, preserved in honey, I thought that possibly a concentrated solution of lump sugar might form a good liquid for mounting animals. In a number of cases it has answered well, the natural colours being preserved, and any leakage soon made up by the crystallisation of the sugar. The chief objection is that substances dissolved from the animals may cause the syrup to turn mouldy at the surface."

CATALOGUE OF THE JACKSONIAN OOLOGICAL COLLECTION.

[A REVIEW.]

ONE of our members, Mr. H. L. White, of Belltrees, Scone, having acquired one of the famous collections of Australian birds' eggs, that of Mr. S. W. Jackson, of Sydney, has issued under the above title a handsome quarto volume containing Mr.

Jackson's catalogue and notes on the collection. The book is for private circulation only, and comprises nearly two hundred pages of surfaced paper, with about a hundred process blocks of birds, nests, and eggs, and the places in which they are found, all exquisitely reproduced. Those who are familiar with A. J. Campbell's "Nests and Eggs of Australian Birds," will remember that Mr. Jackson's photographs formed a considerable part of the illustrations of that work, and will find many old friends much better represented in this new volume.

Special interest is centred in the Jackson Collection, inasmuch as Mr. Jackson was the first to take the eggs of the New South Wales Bird of Paradise (*Ptilorhis paradisea*), better known as the Rifle-bird, and his own notes are given at length for the first time, together with a beautiful series of photographs of the birds, nests, eggs, and the scrubs in which the latter were taken.

Another absolutely unique clutch which reposes in Mr. White's cabinet, is that of the Rufous Scrub-bird (*Atrichia rufescens*, Ramsay). This anomalous Passerine genus has only one near relative, the Lyre-bird (*Menura*), and its two species are, extraordinarily to relate, very restricted in their habitats, and confined to small patches of country on opposite sides of the continent. The bird I am speaking of is confined to the coastal scrubs of northern New South Wales, from the Dorriggo to the Tweed, while the Noisy Scrub-bird (*A. clamosa*) is only found in the scrubby country at the back of Albany, W.A. The nest and eggs of the eastern species found by Mr. Jackson still remain the only ones known to science, and as the scrub in which the bird lives is fast vanishing before the advance of civilisation, and the species is probably doomed to early extinction, they will possibly be even more valuable and interesting in fifty years' time.

Two more of Mr. Jackson's finds were the first authentic egg of the Koel, or Long-tailed Cuckoo (*Eudynamis cyanocephala*), and the top-knot pigeon (*Lopholaimus antarcticus*). It is rather extraordinary that, although this bird is found in such large flocks, its eggs should be so scarce in collections, but when one looks at Mr. Jackson's photograph of his party in the act of taking the eggs from the almost inaccessible tops of a scrub fig, the scarcity is easier to understand.

It is rather a pity that the information afforded about several rare clutches is meagre, but all collectors know the difficulty of obtaining full data. The book as it stands forms a valuable addition to our ornithological literature, and should be helpful when the final history of Australian oology comes to be written.

NOTES AND COMMENTS.

MARTIN JACOBY.—On December 24, 1907, there passed away, at West Hampstead, London, Martin Jacoby, the well-known Coleopterist. The deceased naturalist was a native of Atona, near Hamburg. When about 20 years of age he went to Manchester, where he joined Sir Chas. Halle's orchestra as a violinist. Subsequently he went to London, and joined the orchestra of the Royal Italian Opera. Whilst holding this position he formed a connection as a teacher of his favourite instrument, the violin, and made London his home. To naturalists he is better known as a Coleopterist, his principal writings dealing with the Phytophaga, species of which he has described from many parts of the Globe. Just a few days prior to his death, he read and marked for press in the February number of *The Entomologist*, a paper—his last—"Descriptions of Two New Genera and Species of Australian Eumolpini (Coleoptera Phytophaga)." The deceased naturalist was about 66 years of age at the time of his death.

MOSQUITOES AND MALARIAL FEVER.—Only a comparatively short time has elapsed since the so-called mosquito theory of disease was first brought forward, and even now many persons affect to believe that there is no connection between mosquitoes and the diseases which they are said to carry. That this relation exists has been abundantly proved, and it is of interest to note that centuries ago the medical men of India recognised such a relation between mosquitoes and at least one disease—malarial fever. In a paper read by Sir Henry Blake, Governor of Ceylon, before the Ceylon Branch of the British Medical Association, the following remarks occur:—"In the course of inquiries into the cause of an epidemic of malarial fever in Colombo . . . I received a report from the Sinhalese Medical Association, in which it was mentioned incidentally, that according to the ancient Hindu authorities on medicine, the chief causes of the disease are impure air and water, and the existence of mosquitoes. I requested more precise information, showing that mosquitoes were associated with the causation of malarial fever, and in reply I received extracts from Ancient Indian works. One of these works, compiled from one of the lost Vedas or Hindoo Scriptures, must be at least 1,400 years old, since it is mentioned in writings of the sixth century. The extracts in question refer to twelve kinds of mosquitoes as causing life-destroying diseases:—'Their bite,' it is said, 'is most painful, and causes disease, accompanied by fever, pain of limbs, vomiting, diarrhoea, thirst, giddiness, shivering, burning sensations, etc.'" Other mosquitoes are also referred to, whose bite causes inconvenience such as swelling, itching, etc. Sir Henry Blake, in order to satisfy himself on the point, invited five Sanscrit scholars of acknowledged authority, to investigate the subject.

These gentlemen testified to the correct translation and authenticity of the extracts. These passages, therefore, remarks the *Tropical Agriculturist*, written possible 3,000 years ago, and certainly not less than 1,400 years, are of singular interest, foreshadowing as they do, the great discoveries of Manson and Ross.

ALLEGED LUMINOUS OWLS.—In a recent issue of the *London Times*, Miss L. L. Veley contributes a letter on the subject of luminous barn-owls, in which it is suggested that the emanation is due to the feathers of the birds coming in contact with luminiferous decaying wood in their roosting-places. This suggestion, remarks *Nature*, which has doubtless occurred to many naturalists, affords a probable and satisfactory explanation of the phenomena.

AN INTERESTING MOLLUSC.—Considerable interest attaches to an account by Mr. C. H. Danforth, published in vol. xxiv., No. I., of the *Proceedings of the Boston Society of Natural History*, of a new genus and species (*Pædochione doliiformis*) of pteropod mollusc, from Casco Bay, Maine. The new form, which was taken in plankton, does not properly fall under any established family, although perhaps it approaches most nearly the Clionidae, from which it differs in having an odd number of cephalocones, and the entire posterior part of the body filled by the viscera. In life the creatures swam for some time by means of their fins, and then sank for a time below the surface, after which the swimming was resumed. With the exception of numerous vacuoles in the integument filled with yellowish or yellowish-brown fluid, the body is transparent.

A HUGE DRAGON-FLY.—In part 4 of the *Proceedings of the Linnæan Society of New South Wales for 1907*, Mr. R. J. Tillyard, M.A., F.E.S., describes, under the name of *Petalura ingentissima*, a monster dragon-fly, and which is regarded as the largest species of Odonata known. The total length of the male is 120 mm., and the female 125 mm. In a note upon the species, Mr. Tillyard says:—"When I was collecting in the Cairns district of North Queensland, during the summer of 1904-5, I was told of the occurrence at rare intervals of a dragon-fly of such enormous proportions that I scarcely credited the story. It was said to come swooping down 'like a bird,' and local residents went so far as to declare that 'its bite would pretty well kill you.' When I captured *Anax guttatus* at Atherton I thought this was the species referred to, but when I showed it to a Cairns resident, he declared that the one he had spoken of was far bigger than that. I kept on the lookout, and a few days before I left Kuranda I was rewarded by seeing an enormous dragon-fly along the banks of the River Barrow. I was unable to capture it, but I could see that it

was a *Petalura*. A day later a local collector brought me a female of the species, which he had captured in the bush. It was in bad condition, but measured about $6\frac{1}{2}$ inches across the wings. This year I received from my friend, Mr. E. Allen, of Cairns, a beautiful male, in fine condition, taken near Herberton. With this material to work upon, I was soon able to determine that this enormous dragon-fly, without doubt the largest known, is a new species of *Petalura*, very distinct in many respects from Leach's *P. gigantea*." Admirable figures accompany the paper.

AUSTRALIAN ODONATA.—In addition to the description of the leviathan dragon-fly referred to above, Mr. Tillyard has, in the volume of the Linnean Society already quoted, two other papers dealing with the Odonata of this continent. One is entitled, "The Dragon-flies of South-western Australia," and the other, "On a Collection of Dragon-flies from Central Australia, with Descriptions of New Species." It will be seen that the material worked by Mr. Tillyard is from areas that have, from an entomological point of view, been neglected. The two papers contain not only references to species already known, but also descriptions of many novelties. Dragon-flies are such beautiful insects that it is surprising they should have been so long neglected by collectors; and not only are they beautiful, but their life-histories are peculiarly interesting, and afford a charming study. Now that so many young people are establishing aquaria, dragon-flies might easily come in for a share of attention, for there is much yet to learn of the early stages of many species of this branch of our native fauna.

FOSSIL BUTTERFLY.—A fossil butterfly from the Miocene shales of Florissant, Colorado, has recently been discovered. The insect, which was well preserved, shows the head, thorax, one antenna, and the anterior wings. It has been described by Professor T. D. A. Cockerell, of the University of Colorado, under the name of *Chlorippe wilmattæ*.

LOWER RACES OF MANKIND AND THE APES.—According to the *Museum News* for October, a figure of a native Australian, carefully modelled by an eminent Washington sculptor, has been placed in the Brooklyn Museum alongside stuffed specimens of the man-like apes, in order to illustrate the wide differences between the latter and the lower races of mankind.

MOSQUITOES.—Mr. T. C. Lothian, of Melbourne, is issuing, in book form, an address delivered some time ago by Mr. W. J. Rainbow, F.L.S., entitled, "Mosquitoes, Their Habits and Distribution." This brochure, which will be in reality a nature study-book, will be illustrated by two plates (maps), and fifteen text figures. A short chapter on "Collecting, Preserv-

ing and Mounting" is included in the work, and should prove useful to students. The text is popularly written and free from severe technical details.

AUSTRALIAN MUSEUM.—The contract for the extension of this Institution having been signed, building operations are now in active progress. The addition will contain two large galleries, additional offices, and an up-to-date lecture hall. The work is to be completed within a year.

LINNEAN SOCIETY.—The Annual Meeting of this Society was held on Wednesday, March 25th, when Mr. A. H. S. Lucas, M.A., B.Sc., was again elected to fill the presidential chair. In his annual address the learned President dealt with many subjects more or less familiar to the public. In respect of "Relations of Science and Government," Mr. Lucas said that the Government in its workings should ever have in mind the importance of the conditions imposed on its people, by their environment and being. To master Nature they must understand Nature. Man by his interference had upset the equilibrium among existing organisms, and incidentally by disturbing the balance of Nature he had introduced foes into his own household, and among the organisms which he had taken under his protection. Having advanced so far into the province of Nature, to hold his own and to advance further, he must learn well the character of the country and the resources and disposition of the opposing forces. This knowledge he could only obtain from the workers in science. The public had to pay for the mistakes of the Government, and the experts spoke on behalf of the public. It was the science of the expert which stayed the plague and checked diphtheria, and it alone could reduce the scourge of typhoid and those other curses of civilisation. It was only science that could teach men how to deal with droughts, profitably cultivate lands, improve stock, and best draw on the other supplies of Nature.

PAYING FOR IGNORANCE.—In the course of his presidential address Mr. Lucas said:—"It was probable there was no ignorance for which man did not pay. Australians had to pay for the ignorance of one of the legislatures of the propagating powers of the rabbit, and the Victorian farmers were paying for the ignorance which allowed the introduction of the fox, and in a few years the farmers of New South Wales and South Australia would be similarly affected. How light-heartedly the sparrow was admitted to the rights of Australian citizenship, and how much money was needed for the eradication of Bathurst burr, prickly pear, sweet briar, codlin moth, waxy scale, and other pests to the producer. Fortunately those costly lessons had not been lost to the legislatures, and a watch was being kept against them. To avoid such penalties in the

future it was necessary to train and employ the scientific worker. There were signs both here and elsewhere that responsible ministers were recognising that skilled knowledge must play a larger part in the administration of public affairs."

NATIVE FAUNA.—This was another point touched upon by Mr. Lucas in his address to the Linnæan Society. He said:—"An acquaintance with the nature and habits of Australian mammals and birds might lead to a cessation of the wanton destruction of many which were either commercially valuable or useful as destroyers of pests to the farmers and fruit-growers. In connection with all such matters science was the natural ally of the Government, and without it there could 'only be a blind groping in the regions of undefined possibilities.'"

CULICIDÆ OF THE WORLD.—Mr. F. V. Theobald, M.A., has just issued, through the Trustees of the British Museum, another volume (vol. iv.) of his masterly work, "A Monograph of the Culicidæ of the World." The new book consists of xix.-639 pages, and is illustrated by sixteen plates and 297 figures in the text. All species that have been described since 1903 are included, together with others which are now made known to science for the first time. The author states in his preface that "The number of specimens received since the appearance of the last volume has been about twelve thousand, and nearly half of these have not yet been examined. Although a large number are well-known species, there are apparently many new to science amongst them." From this we may assume that a further large volume will hereafter be added to the four now constituting the work. Mr. Theobald draws attention to the questionable practice of Messrs. Dyar and Knab, two American naturalists, in making *species* out of larvæ of which the adults are not known. Sooner or later the adults may be described, or the named larvæ may be fixed to the already described adults, and then we shall have the *Culicidæ* in the unsatisfactory position of having dual names. Surely the synonymy is bad enough already without this.

BABYLONIAN INSCRIPTIONS.—The series of Babylonian inscriptions in the British Museum has been enriched by a number of tablets of unusual interest. One of the most notable additions to the collection is a large inscribed baked clay cone of about B.C. 2145, on which is an inscription in seven columns, commemorating the rebuilding of the great wall which surrounded the city of Sippar, in Babylonia. There is also a long list of titles of the King of Babylon of that period, and his achievements are described at length. This cone is said to be the largest example of the class now known.

THE Australian Naturalist.

VOL. I.

JULY 1908.

PART 11.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held in the Board Room, 82 Pitt Street, on Thursday evening, April 2nd, 1908, the President, Mr. S. J. Johnston, B.A., B.Sc., in the chair.

NEW MEMBERS.—Messrs. G. H. Johnston, Wiseman, and Moreau, were elected ordinary members of the Club.

PRESENTATION.—Mr. Henry L. White, of Belltrees, presented to the Club Library a copy of the "Catalogue and Data of the Jacksonian Oological Collection," a work of which only one hundred copies were printed for private circulation, and consequently an extremely valuable gift.

PAPER.—Mr. L. Harrison read a paper—"Notes on a Collecting Trip to the Richmond River," which had special reference to the birds of the Broadwater district, and was illustrated by a large series of skins and eggs.

PRESENTATION.—At the close of the ordinary business, Mr. W. J. Rainbow, on behalf of the members of the Club, presented the Hon. Secretary, Mr. L. Harrison, with a handsome set of table cutlery, and in doing so congratulated him upon his marriage, and expressed the wish, endorsed by the members, that he and Mrs. Harrison would enjoy long and prosperous lives.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held in the Board Room, 82 Pitt Street, on Thursday evening, May 7th, 1908, the President, Mr. S. J. Johnston, B.A., B.Sc., in the chair.

NEW MEMBER.—Mr. H. Dickeson was elected a country member of the Club.

PAPER.—Mr. C. Hedley, F.L.S., gave an interesting lecture on "Torres Straits," illustrated by a fine series of lantern slides.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held in the Board Room, 82 Pitt Street, on Thursday evening, June 4th, 1908, the President, Mr. S. J. Johnston, B.A., B.Sc., in the chair.

NOMINATION.—Mr. R. P. Sellars was nominated for membership.

PAPER.—Mr. W. J. Rainbow, F.L.S., read a paper on "Primitive Man: his Foods, Medicines and Charms, from an Entomological Standpoint."

MR. STEAD.—The President announced that Mr. D. G. Stead, following upon the transference of Mr. C. H. Dannevig from the N. S. Wales Department of Fisheries to the Federal Government Service, had been promoted. The members present, by resolution, unanimously and heartily congratulated Mr. Stead.

TORRES STRAIT.

(Abstract of a Lecture by Mr. C. Hedley, F.L.S.)

"Torres Strait" was the subject of a lecture to the Field Naturalists by Mr. C. Hedley. Since the first human population and a large proportion of the fauna and flora entered Australia at this point, the Strait might well be termed the Gateway of Australia. At no other point does the continent so nearly approach the outside world. The lecturer suggested that if a series of islands had existed between New Zealand and New South Wales, the Maoris would have taken advantage of them to reach and colonize Australia, and that the subsequent history of Australia would have been influenced.

Considering the low state of the Australian aborigines it is remarkable that other races of higher civilization did not oust them from their heritage. It was shown that a strong fighting tribe held the extremity of Cape York, and beat back attempted invasions by the Papuans. The national Australian weapon—womera and throwing-spear—delivered a heavier missile at a longer range, than did the bamboo bow and arrow of the Papuan marauders. Doubtless the prompt and determined resistance offered to Captain Cook by the Cape York natives on the occasion of the British annexation was their usual attitude to a head-hunting foray of the Torres Islanders.

In contrast to the Australian aborigines, who were merely nomad hunters, the Torres Islanders were described as expert navigators, successful agriculturalists, keen traders and clever mechanics. Originating from the New Guinea coast, they had explored, colonized and cultivated the whole archipelago.

From a geological aspect the Islands fall into three groups. Firstly, the high continental islands, of granitic formation, which are practically a continuation of the Cape York Peninsula across the Strait. These islands are the peaks of a submerged isthmus that in Tertiary times linked the smallest continent to the largest island.

Eastward and parallel to these run a chain of low coral islands, or cays, and still further to the east is a group of volcanic islands.

One of the latter, Murray Island, was visited last year by a party from the Australian Museum in charge of the lecturer. The extinct crater of Murray is one of the largest in Australia, being about five miles round. It is built of ash, ejected steadily and continuously for a long period. A flow of lava concluded its activity. The influence of the trade wind on the crater lip is peculiar. Since there is never a south wind the lip on the north side is wanting, while the south-east trade has, on the opposite side, piled the culminating point, and the north-west wind, which only endures half the time, has produced a lower hill of corresponding height and position. Enclosed masses of coral show that the volcanic pipe burst through a sunken reef.

The whole aspect of the island is foreign. Australian vegetation is absent; indeed, this is the least Australian of any land within the Commonwealth. Its appearance is rather that of one of the South Sea Islands.

PRIMITIVE MAN: HIS FOODS, MEDICINES AND CHARMS, FROM AN ENTOMOLOGICAL STANDPOINT.

(*Abstract of Lecture by W. J. Rainbow, F.L.S.*)

In introducing his subject, Mr. Rainbow said this was an address that might with propriety be termed "An Ethno-Entomological Study," since it dealt with certain habits and customs of primitive man. By primitive man the lecturer meant all those races of mankind, past or present, who had lived, or were now living, in a state of barbarism or semi-barbarism; but the term "Entomological" had to be accepted in its broadest possible sense, because it would be necessary to include such animals as Scorpions, Spiders and Centipedes, which, strictly speaking, were not insects at all.

Savage man, either from necessity, habit or taste, had applied certain invertebrate animals to his use, either as food, medicine, ornament, or charm, and these were included in a wide range of species. Civilised man had also found some insects of the greatest economic value to him. There were, for instance, the honey-bee and the silkworm, both of which he had gone so far to domesticate and improve by artificial selection. And some others, which he had not domesticated, were also of important economic value to him, such as, for instance, the cochineal insect—*Coccus cacti*, and the Cantharids, or Blister-flies. From the first of these a harmless colouring ingredient was obtained for giving an artistic effect to confectionery, whilst the latter are to this day prescribed at times by medical men for blistering purposes, and in some diseases as a medicine to be taken internally.

FOOD.—It has been said that "he was a bold man who first put a live oyster into his mouth," but what shall be said of the individual who first put a live spider there? When we study the habits of savages we feel little or no surprise that they eat all sorts of, what are to us, horrid things. The aborigines of New Caledonia collect large numbers of an orb-weaving spider, known to naturalists as *Araneus edulis*, which they roast and eat with relish. Disgusting as this may appear, it is not nearly so bad as some instances of Europeans—and educated people at that—who have been recorded as regarding spiders in the light of delicacies. Réaumer has told us of a lady of his acquaintance who, whenever she walked in her grounds, never saw a spider that she did not want to eat there and then; the famous Anna Maria Schurmann affirmed that living spiders tasted like nuts. Then, on the authority of Latrielle, we learn that the famous French astronomer of his time, Lalande, was particularly fond of eating living spiders. The Australian blacks do not appear to have utilised spiders as food. Savages, however, eat so many things that a white man would turn up his nose at, that it is quite possible that, in times of great scarcity of food, spiders may have been eaten, and the fact not recorded. Humboldt, in Vol. II. of his work, "Personal Travels," relates the fact that he saw Indian children drag centipedes out of the earth and eat them. Various savage races have eaten not only grasshoppers, locusts and cicadas, but also caterpillars, beetles, wasps and white ants. Indeed, many of these insects are considered valuable from a food point of view. Beetle grubs, especially the lignivorous forms, are eaten, both raw and roasted, by our blacks in different parts of Australia. Roasted on embers they are considered to be both delicate and nutty in flavour, varying in quality according to the tree in which they bore and on which they feed. Those obtained from the trunks of the common wattle are most in favour. Beetles have been eaten by many races of people. Amongst these insects, the Sacred Beetle of Ancient Egypt was the most important. In Arabia and Turkey, ladies search for a special species of beetle, which they fry in butter and eat with the object of enhancing their beauty. Grasshoppers and locusts, both cooked, raw, and dried, have contributed largely to the food supplies of primitive man. Diodorus Siculus mentions a race of Ethiopians who were so fond of eating these insects that they were called *Acridophagi*, or locust-eaters. The Central Australian blacks call grasshoppers which they eat *mara*, but this name is also applied to the honeycomb of the bee. In tropical and sub-tropical regions of both the old and new worlds, white ants have been highly esteemed. On one occasion that great missionary and traveller, David Livingstone, was visited by a Bayeiye Chief, to whom he gave a slice of bread, with preserved

apricots. Noticing that his dusky visitor appeared to enjoy the dainty, Dr. Livingstone asked him if he had any such delicious food in his own country. "Ah!" replied the chief, "Did you ever taste white ants?" "Never," said Livingstone. "Well, if you had," was the response, "you would never have desired to taste anything better!" Smeathman tells us that several African tribes eat white ants roasted, boiled, and raw; and then adds his personal opinion that the individuals eating them soon get into good condition through feasting on this nutritious food. All our Australian aborigines are very fond of white ants. Both bees, ants, and wasps have also contributed largely to the food supplies of our blacks. From the first of these, of course, honey is obtained. To learn where the honey is, bees are hunted by sight. An insect may be caught in the open, smeared with iguana fat, and some birds' feather down stuck upon it; it was then let loose and followed home. The Bugong Moth is well-known as an item of blackfellows' diet. On the Bloomfield River, the pupa of a butterfly is eaten. The blacks in that district know it by the name of *bi-i-bi-i*. Cicadas were regarded as providing a dainty dish by Roman epicures. In Australia, the Mackinley Range natives eat the pupæ of a species of cicada.

MEDICINE.—Scorpions, spiders, millepedes, cockchafers, lady-birds, earwigs, flies and ticks have been largely used as medicine. In illustration of this side of the question, the lecturer gave a number of quaint and interesting examples, the enumeration of which space alone forbids.

OBSERVATIONS ON FROGS.

(By Mr. E. Clunies Ross.)

On the 5th April, while at Mosman Bay, my attention was directed to two small frogs that were to me entirely new, and having learned where these had been found, I went thither on a collecting trip. There are several things one should remember when preparing an outfit for frog-catching. The first care should be to see that one's jars have neither too little nor too much water; frogs kept in a dry or absorbent receptacle die from lack of moisture, whilst those kept in water drown. One should also take sufficient jars to permit of separating large from small specimens. An almost indispensable part of the outfit is a transformed butterfly net. The net part should be made of strong mosquito net, and the wire ring be not more than a foot in diameter. Arrived at the pools, I made as my first capture a tadpole in the third stage of growth. A tadpole first develops his hind legs, and even in the smallest specimens I have been able to see rudiments of these, though still contained in the transparent outer mass that surrounds the core of the tail. The fore limbs are not developed for some

considerable time after the hind. They first appear as buds on the side of the tadpole, the left arm developing before the right. These little chaps are frequently to be observed floating, all limbs extended, on the surface of pools, and swim and dive with surprising celerity. Tadpoles which I raised at home generally left the water about the fourth day after the acquisition of their limbs. The tail is still present when they leave the water, and may be found on quite large frogs. My tadpoles were caught at all ages, and reared in an old tin basin on the bottom of which was a layer of earth, an inch or so thick. Those tadpoles which thrive and developed the most rapidly were fed on meat. A few small scraps of any meat would suffice for a day's feed for forty individuals. A tadpole when eating seems to suck; it can scarcely be called nibbling. I have frequently got one to tackle my finger, and the sensation is like a faint tickling. The horny lower-lip can be distinctly felt. Some tadpoles once nibbled some bread I gave them, but they died very shortly afterward. Whether this was due to the effect of the bread on the digestion of the tadpole, or fermentation poisoning the water, is uncertain, but I am inclined to favour the latter theory. Tadpoles kept in a perfectly clear jar also died. Too much sunlight also affects them. My most successful results were obtained from tadpoles kept in a room, and whose water was changed daily. A very efficient way of changing the water is to let the tap gently run into the full aquarium, as this gradually replaces the stale water and does not disturb either the tadpoles or the position of articles in the aquarium.

To continue with the story of my excursion, however, a few minutes after my first capture I had specimens in all three stages of growth, a fact that proves that the breeding season extends over some considerable period, since it takes a tadpole some time to get his hind limbs, and these he has for a good while before his fore-legs appear. I have not as yet been able to take the time for each process, but the time that elapsed between the appearance of the "buds" to the acquisition of developed fore limbs was, in a specimen of *Hyla aurea*, 2.1 inches in length, nine days. Shortly after bagging my tadpoles I had the good fortune to disturb a colony of *H. phyllochroa*, and a dozen or so of these pretty little fellows were soon transferred to my jar.

The way I manage to carry frogs and tadpoles in the same jar is this: I put not more than two inches of water in the jar and then insert a fair-sized bunch of weeds, this serving as a rest for the frogs. But even with this, tiny specimens of *H. phyllochroa* were not happy until I was able to transfer them to a drier jar. This capture was followed shortly by the finding of absolutely the smallest frogs it has been my fortune to see. In the lack of definite details as to their proportions,

an idea of their size may be gained from the fact that the surface tension of a drop of water held one of these little creatures helpless on the side of the jar. To a casual observer the ground here was bare and devoid of attraction, but here I found some of my most interesting and instructive specimens. These small frogs proved to be specimens of *Cunia signifera*, and this fact at once leads to some interesting deductions, viz., that both the size and habits of frogs vary greatly according to the circumstances of their birth and surroundings. The small frogs were admirable swimmers and divers, remaining for very considerable periods under water. They progressed entirely by hops, and lay still against the ground when harassed. Some that I caught at Ashfield were quite thrice the size of these. When they emerged from the water they would walk beetle-fashion when unhurried and undisturbed, but would burrow to escape observation. My attention was now attracted by the cries of *Pseudophryne bibronii*, which are unmistakable, being somewhat like the noise made by gently striking a wax match on the rough end of a box, and on raising a flat stone about a square foot in area by an inch thick, I found two of these frogs in about a quarter of an inch of water. To the larger of the two were affixed numerous eggs, others being scattered round about. The eggs were about 4 m.m. in diameter, and consisted of a black nucleus surrounded by a transparent coating of a jelly-like substance. These frogs made practically no attempts to escape. *P. bibronii* is an indifferent swimmer, and its motions in the water are much like its movements on land, where, if tired or undisturbed, it progresses with a turtle-like waddle. One of these little frogs gravely walking across the floor presents an appearance quaint in the extreme. Though able to make considerable leaps, it usually makes instead a series of quick jumps when disturbed. These jumps will not be more than two inches in length. A third specimen of *P. bibronii* was my last capture. On the whole I was very well pleased with the results of my trip.

BIRD NOTES.

(By Mr. L. Harrison.)

Early in May of this year I was informed that the pallid cuckoo (*Cuculus pallidus*) was about at Killara, but I did not credit my informant, who was only a young observer, as I myself had seen and heard many of the fan-tailed species (*Cacomantis flabelliformis*) in the neighbourhood, and concluded he had been mistaken in his identification. Towards the middle of the month, however, I heard several of the birds on three or four successive mornings about my own house, and they were certainly of the pallid species. A week later they were gone, and I have heard none since.

This is the only occasion, in my fifteen years' experience, that I have caught the pallid cuckoo out of season. I had always pinned my faith to him as a regular migrant, rarely coming south earlier than August, and returning north again in February or March. The bronze cuckoos of both species are notoriously irregular migrants, and are, at the time of writing (mid-June), plentiful about this district; while the fantailed cuckoo does not migrate at all—at least in the Sydney district.

I am very interested to find that the gullies at the head of Middle Harbour afford a last stronghold for a few of our larger and rarer species, which I had not imagined to breed so close to Sydney before. The lyre-bird may be heard in all his glory within six miles of the G.P.O., but I would like to stipulate that this information is solely for the use of naturalists, and meant to be kept particularly dark from the world at large. Unfortunately, promiscuous gunning, and particularly Sunday shooting, is very rife along the Milson's Point line, and I fear that, unless something is done promptly to put a stop to it, the remaining few of these interesting birds will disappear.

A pair of white-bellied sea-eagles also inhabits the calm upper waters. When I resided at Manly I occasionally saw these magnificent birds of prey about Middle Head, but took them to be the pair which breeds on Scotland Island, at Newport. I find, however, that they are safely domiciled on a barren and precipitous sandstone bluff on the northern side of the harbour, where they have bred in safety for years. I have not yet inspected the eyrie, but hope to do so shortly. Would it be possible to obtain special protection for this noble pair of birds? Surely they are worth keeping, but their long immunity seems to be making them dangerously tame.

A pair of whistling eagles, the smallest of our eagles, has a nest in a gully running down from the railway to the harbour. It is quite inaccessible to the egg-collector, being over one hundred feet from the ground, and the birds are likely to breed for many years, if they can but keep out of the reach of the thoughtless pot-hunters and irate hen-fanciers.

It is a splendid thing to see such birds within a few miles of the heart of the city, and I would like to find some adequate means to keep them there.

PARASITIC ENTOMOLOGY.

(By Mr. E. G. W. Palmer.)

To Western Australia belongs the credit of having done more, and having spent more, than any other of the Australian States in trying to establish within its borders the insects parasitic on the pests of the orchardists and agriculturists generally.

Mr. Compere has been well financed and backed up by his Government in the endeavour, oft repeated, to secure from other lands the tiny creatures that keep in check the Aphides, scales and grubs that so ravage our vegetables, shrubs and fruits, and in several of his voyages and travels he has come across the little insect friends he has been in search of, and has been successful in acclimatising them among the orchards of W.A., where some have done good service, of which there is incontestable evidence in the almost complete destruction of the cabbage aphid in some gardens; in the twigs and boughs of shrubs infected with scale pests of various sorts, every one of which was dead—with a hole at the apex of each, where the little friend and ally of the fruit grower had applied her ovipositor and laid an egg which, hatching into a grub of minute size, had feasted upon the mother scale and her brood of sheltered young, so clearing the plant of its sap-sucking, irritating enemies.

Fruit flies have, in all our States, developed marvellously in recent years, and are now the bane and terror of every man who owns a fruit tree. Peaches, apricots, nectarines, and other luscious fruits—even the hard, solid quince and the apparently armour-clad orange and lemon are now the spoil of one or other of the varieties of Fruit Fly.

Mr. Compere first undertook the task of searching for a parasite in 1902, and succeeded in locating one species in India in 1903. Later on several species were found in Brazil, but difficulty after difficulty beset the endeavour to keep the insects alive in their necessarily long voyages and travels, and in bridging over the period that exists between the temperature and seasons in India and Brazil and Australia. Too often the little flies were fated to hatch out and die because no proper food could be found at that time of the year.

However, a few failures and disappointments did not deter from further effort, and eventually all difficulties were overcome.

Having during February of this year many days of leisure, while spending a month in Perth, the writer several times wended his way to the Entomological portion of the Department of Agriculture, and there by the courtesy of the Officers associated with Mr. Compere (who is now away on a collecting trip), he was able to watch and study the developments and life history of some of the genera that are now proving their power to check and limit the pernicious forms of insect life.

In December, 1907, Mr. Compere landed in W.A. with a large stock of pupæ of Fruit Fly, all heavily parasitized. Soon the tiny Ichneumons began to appear, and though early in the season, some fruits were collected containing maggots of the Fruit Fly, which, being placed in the cases or cages with the parasites, these at once commenced their attack upon them

with an alacrity and intensity of purpose very interesting to watch.

We were privileged to see the first lot of West Australian bred parasites hatched out. The larvæ, though exposed to view by division of the fruit, lay perfectly quiescent until in some inexplicable way they became aware of the near approach of their minute foes, when they suddenly roused to activity, twisting and whirling and rolling over in futile endeavour to avert assault, but the Ichneumon's attack was direct, and fixing herself firmly upon her selected prey, she curved her abdomen and struck home with her ovipositor as she laid her eggs deep in the body of the hapless maggot, which was thus doomed to afford food and lodging for his very unwelcome guests. Nor is it a single guest only that he is forced to entertain, for as many as thirty-six parasites have been counted emerging from a single pupa.

Mr. Compere has introduced two other Ichneumons of somewhat larger size, but these limit their laying to one egg in each maggot selected, and consequently their reproduction is not so rapid as the species above referred to.

NOTES AND COMMENTS.

CLUB ADDRESS.—Will members please note that in future the official address of the N.S.W. Naturalists' Club will be 300 George Street, Sydney, and not Box 1216, G.P.O., as heretofore?

NATURE POETS.—The Council has decided to put aside an evening during the next quarter for the study of Nature poetry. English literature is full of beautiful thoughts upon many subjects, dear to the hearts of naturalists; and in this direction, numerous references are to be found in Australian verse. Members of the Club are invited to prepare short papers, with poetic quotations, and those who are willing are requested to communicate with the Secretary. Can some of our country members assist?

LEON FAIRMAIRE.—The death is announced, at the advanced age of 88, of the great French entomologist, Léon Fairmaire. His first paper, which was published in 1843, was entitled "Description de trois nouvelles espèces de Coléoptères de l'Océanie," and his last "Coléoptères nouveaux de Madagascar, faisant partie des collections du Muséum." Altogether from 1843 to 1906 no less than 449 scientific memoirs were catalogued to his credit. Even during the troublesome and exciting period of 1870 Fairmaire found time to make additions to entomological literature. Some of these memoirs are, of course, brief, but others take the dignity of monographs. Fairmaire was the descendant of an English family named Farmer.

THE QUEENSLAND NATURALIST.—The Field Naturalists' Club of Queensland, falling into line with Southern sister clubs, has established a quarterly journal under the title of *The Queensland Naturalist*. No. 1 of Vol. I., bearing date 31st March, 1908, has reached us, and an excellent number it is. It contains the Presidential address—"Linnaeus and Buffon," by Mr. Henry Tryon; "The Brisbane Tertiaries," by Mr. Sydney B. J. Sketchy; "Notes on Specimens of Magnesite from near Toowoomba, Queensland," by Messrs. L. C. Green and Arthur T. Hockings; and "Notes on Rotifera," by Mr. W. R. College. We would specially recommend our own members to read the address on "Linnaeus and Buffon," as it is not only a masterly composition, but contains much matter of interest that may be fresh to many, respecting the lives, work and methods of the two great naturalists. The other papers are worthy of perusal by those interested.

BIRD CHASED BY A BUTTERFLY.—Miss M. E. Fontaine, F.E.S., under date: Durban, Natal, December, 1907, contributes to the April number of *The Entomologist* the following curious note:—"One day while I was collecting in the birch woods at Durban, I was much interested to see a specimen of the *Papilio lyceus* in hot pursuit of a bird; he was chasing it in exactly the same manner that many of these big *Papilios* will chase away other butterflies from their own immediate neighbourhood; and the bird, which was about the size of a blackbird, was flying rapidly before his pursuer, showing every symptom of fear and trepidation, while the butterfly continued to pursue the intruder for some distance before returning to his former perch. Most collectors will doubtless have occasionally seen a bird pursuing a butterfly (though generally without affecting its capture), but I should be interested to know if anyone has ever before observed the relative positions reversed."

CHELIFERS.—Those minute Arachnids, the Chelifers, or False Scorpions, are often transported from place to place by insects such as beetles and house-flies. In *The Zoologist* of April 15, Mr. E. Ernest Green, of Peradeniya, Ceylon, writes as follows anent the curious habit of a species of Chelifer that had come under his observation:—"The stems of our trees are frequented by gangs of the large and ferocious ant (*Ecophylla smaragdina*). Occasionally one of these ants may be found struggling vainly to extricate its foot from some crevice in the bark. Investigation will show that the foot is firmly held in the chela of a small *Chelifer* safely ensconced beneath the bark. And there it may be held day after day until it dies of starvation. I have found the ants hanging dead, still in the grasp of their captors. I do not think that the *Chelifer* has any special purpose in the capture. I have never seen one feeding upon the ant. The probability is that the little animal instinctively grasps

the intruding foot, and holds on pertinaciously as long as it feels any resistance."

NEW AUSTRALIAN CHITON.—Messrs. R. A. Barstow and J. H. Gatliff describe and figure in "Proceedings of the Royal Society of Victoria," Vol. XX., 1907, pp. 27-30 (2 plates), *Enoplochiton torri*, sp. nov., from the coast of Queensland. If the reference to *Enoplochiton* is correct, the species is very interesting geographically, for the other species of the rare genus, *E. niger*, Barnes, occurs on the coast of Peru.

DIMORPHISM OF AUSTRALIAN AGRIONIDÆ.—Mr. R. J. Tillyard, in "Proceedings of the Linnæan Society of New South Wales," 1907, pp. 282-90, records dimorphism of the females in two Australian genera. These two contain the smallest and weakest species of the dragon-flies known in Australia, a point which the author regards as strengthening the contention that the existence of dimorphic females is in some manner or other connected with the preservation of the species. The forms exhibiting dimorphism are *Ischnura delicata*, Selys, and *Agriocnemis splendida*, Martin. The two genera referred to, though differing widely in their wing-structure, have many points of similarity.

A NEW FUNGUS.—A sample of bread that had been left wrapped in parchment for some time was found to have developed a growth of a white, chalky fungus. A German scientist, named P. Lindner, examined it, and found it to be a new species, *Endomyces fibuliger*. It has the power of forming hat-shaped spores, and can ferment various sugars, thus resembling *Willia* yeasts; but it does not give a yeast generation free from mycelia in fermenting liquids.

MOSQUITOES.—"Mosquitoes: their Habits and Distribution":—This is the title of a neat little book (T. C. Lothian, Melbourne), written by Mr. W. J. Rainbow, of the Australian Museum. It deals with Mosquitoes from many points of view, and gives within a small compass an astonishing amount of interesting and well-arranged information. The book is very readably written, is well illustrated with numerous clear figures, and should appeal to a large body of readers.

DEMISE OF TWO WELL-KNOWN ENTOMOLOGISTS.—Death has been very busy of late amongst men well-known in Natural History circles. In England Mr. A. J. Chitty, M.A., F.E.S., and Dr. H. G. Knaggs, F.L.S., have each passed away. The former was an established authority on Coleoptera, but other branches, such as Hymenoptera and Hemiptera, attracted his attention; the latter was widely known by his "Lepidopterists' Guide," a popular work, now in its third edition. The guide contained much information of value to the young collector, in respect of the collecting, rearing and preserving of Butterflies and Moths.

THE
Australian Naturalist.

VOL. I.

OCTOBER, 1908.

PART 12.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt Street, on Thursday evening, July 2, 1908, the President, Mr. S. J. Johnston, B.A., B.Sc., in the chair.

NEW MEMBER.—Mr. R. P. Sellars was elected an ordinary member of the Club.

LECTURE.—Mr. E. J. Goddard, B.Sc., delivered an address on "Deep Sea Life," illustrated by lantern slides.

AUDITORS.—Messrs. Gilbert and Carruthers were elected as Auditors.

ANNUAL MEETING.—The Annual Meeting was held on August 6, 1908, Mr. S. J. Johnston, President, in the chair, when the Annual Report of the Council, and the Hon. Treasurer's Balance Sheet were read and adopted. The retiring President delivered an address on "Lizards," illustrated by lantern slides.

ELECTION OF OFFICERS.—The Officers and Council for the ensuing year were elected as per list on cover.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held on Thursday, September 3, 1908, the President, Mr. D. G. Stead, in the chair.

NEW MEMBER.—Mr. W. Bullock, Parkville, was elected a member of the Club.

BIRD PROTECTION.—The President announced that an agitation was on foot for the better protection of our native birds, and suggested that the Club should identify itself with the movement. This was warmly supported by Mr. Harrison, and a committee consisting of the President, Hon. Treasurer and Hon. Secretary, were appointed to act as delegates, in conjunction with other societies, in approaching the State Government on the question.

LECTURE.—The President delivered an address, illustrated by the lantern, on "Fishes, Edible and Quaint."

EIGHTH ANNUAL REPORT.

In presenting the Annual Report, the Council has much pleasure in reporting that the strength of the Club, both numerically and financially, has increased considerably during the year.

During the year the Council received with deep regret the resignation of Mr. J. R. Garland, M.A., as Hon. Treasurer, which position he had held since the inception of the Club, continued ill health being the reason for the resignation. The Council is pleased, however, to learn that Mr. Garland has now completely recovered his health. Mr. H. E. Finckh was appointed to the position of Hon. Treasurer, and Mr. G. A. Waterhouse, B.E., B.Sc., F.E.S., was elected to the vacancy on the Council.

During the year sixteen ordinary and one country member were elected, while ten resignations were received. Ten ordinary meetings were held, at which interesting papers were read.

Four additional parts of the AUSTRALIAN NATURALIST have been published, and the Hon. Editor would again remind members that personal field notes would make the journal of still greater interest.

In addition to the Armidale Branch the Bega Branch has now affiliated, with a membership of ten.

The usual working excursions have been held throughout the year, and the Council regrets having to report that the interest in these useful outings has hardly been maintained. It is trusted that with the approaching collecting season a more satisfactory condition of affairs will prevail.

One of our members, Mr W. W. Froggatt, has just returned to Australia after an extended tour round the world in search of parasites for fruit pests, a mission for which he was specially chosen by the joint Governments of Australia.

Another, Mr. D. G. Stead, is to be congratulated on his appointment to the position of Superintendent of Fisheries Investigations and Marine Fish Hatchery.

The Council desire to place on record its appreciation of Mr. H. E. Finckh's work and energy in the interests of the Club. His zeal as treasurer is apparent from the excellent balance sheet submitted to the members; while his kindness in placing his rooms at the service of the Council, and in taking charge of the bulk stock of publications, and thus clearing the way for a satisfactory arrangement of the Library is warmly felt.

S. J. JOHNSTON, President.

LAUNCELOT HARRISON, Hon. Secretary.

THE STUDY OF LIZARDS.

(Presidential Address by S. J. Johnston, B.A., B.Sc.)

One finds the study of lizards especially interesting on account of the many striking illustrations they afford in various absorbing zoological problems. Avoiding the discussion of technical details, I wish to confine my remarks, as much as

possible, to questions of a general nature, likely to be of interest to members of the Club; and a number of lantern views will show peculiar variations in form, structures adapted to environment, interesting points in distribution, interesting habits, etc. In giving a short account of some of the more important or interesting families of lizards, the peculiar variations in form exhibited by the various members of the group will be touched upon, but in the meantime, a few general remarks may be made in regard to the striking adaptation to surroundings that many of these variations show.

According to the diet, we find the teeth and the alimentary tract variously modified, *e.g.*, in carnivorous forms the intestine is relatively short, while it is long in the vegetable feeders. This correlation is found not only in lizards, but in most vertebrates. The tongue, which is often used for picking up the food, is variously modified, and often takes the form of an effective shooting organ, capable of being shot out several inches, dabbing insects and the like with great precision. It is interesting to note that in one genus of lizards, *Heloderma*, the salivary glands are modified into poison glands, and the teeth grooved.

But most of the adaptive modifications are restricted to the external organs such as the skin, limbs, tail, eyes. Most lizards are capable of changing the colour of their skin to a certain extent, the stimulus being through the emotions. In regard to the limbs and the shape of the body, we find forms specially adapted for climbing or running swiftly, or burrowing in the ground, or even flying. The flight, however, is not of an active nature; the wing-like structures are used as a parachute, enabling the owner to sail downwards and outwards a considerable distance.

In the *Zoologische Garten*, 1889, Boettger has published some very interesting work on the influence of climate and the nature of the country on the animals inhabiting it, with special reference to a particular region—the Transcaspiian desert region. Dr. Gadow gives an excellent synopsis of this work in the Cambridge Natural History, in his volume on Amphibia and Reptiles; and I wish here to express my special indebtedness to Dr. Gadow's work in the preparation of this address.

In the Transcaspiian desert the winter is short but very severe, while the summer is prolonged and extremely hot. There are no trees and hardly any shrubs, and most of those that do occur have narrow, grass-like blades for leaves. Little mounds of earth and sand surround the shrubs, and these little shelters form a retreat for lizards, snakes and rodents.

Adaptations to this peculiarly inhospitable environment are strikingly shown in some of the lizards:

The Geckos are a family of lizards occurring all over the world, and they are generally found climbing about rocks or

trees, and have special structures developed for this work. These are adhesive lamellæ arranged on the under-surface of the digits. *Teratoscincus*, a gecko living in this desert region, where it runs about on the sand, has digits without these lamellæ, but they are granular below and strongly-fringed laterally to enable it to run quickly on the sand. Instead of the soft granular skin on its upper surface, such as one generally finds in geckos, its back and upper parts are protected by a hard, scaly covering. The upper eyelids are enlarged so as to keep the sand out of its eyes.

Phrynocephalus, one of the Agamidae, a family of lizards of which our common jew-lizard is a typical member, lives in this desert, and has long lateral fringes on its digits so as to enable it to run quickly on the sand. Its body is flattened or depressed in form, and devoid of dorsal crest, and there are lateral folds of skin on the body, by means of which it can shake sand over itself and rapidly disappear from view. It runs so fast that one can scarcely see anything but its shadow. It can change its direction of motion like lightning, and with a pause in its flight, by a few dexterous shakes of its lateral folds, it is covered with sand and has disappeared from view. To protect its special sense organs from the sand there is no external ear opening at all, and the margins of its eyelids are broadened into plates, which keep the sand out of its eyes.

A very interesting feature in lizards is the power they have of regenerating lost parts. Many lizards, having lost the tail, can grow a new one, but this phenomenon is perhaps best seen in the geckos. The fat, swollen-looking tails of these interesting little creatures can be thrown off at will. When pursued by an enemy and almost in its clutches, the tail is thrown off; and while the aggressor delays to devour the tail the gecko makes good its escape. The break always occurs in the middle of a vertebra, where there is a plate of cartilage, the cells of which have retained their youthful character, and from this plate mainly the new tail is produced. But instead of a spinal column, only a cartilaginous rod is produced, so that the new tail is in reality only an imitation one. It is an interesting point that this is a reversion to a very primitive type, for in the very lowest of the vertebrates the whole spinal column exists in this form. The arrangement of the scales on the new tail, too, is often different from that of the original tail, and resembles that of an ancient ancestral form of the lizard in question.

The pineal body or pineal eye is a well-marked structure in lizards. It is a process found in all craniata, given off from the dorsal surface of the brain. It consists of a proximal narrower part known as the stalk, and a more rounded terminal part the pineal body. It lies quite close to the surface of the

skull, and in some lizards is covered only by a transparent scale. For many years the meaning of this structure lay in obscurity, and some remarkable functions have in the past been attributed to it by the older physiologists, but recent researches have shown it to be really a degenerate eye. It retains its highest state of development in the lizards and some of their allies, and is still in some slight degree functional in many of them. It is very well seen in a section, shown here to-night, of the head of *Lygosoma quoyi*, a skink common in the neighbourhood of Sydney.

Many lizards have lost their limbs and assumed a very snake-like form. We find that the habit of living in burrows in the ground is accompanied by a partial or complete reduction in the limbs. This loss of the limbs, too, is often correlated with an elongation of the trunk and tail, so that the snake-like form is emphasised.

Reduction of the limbs has occurred in a number of families not directly related to one another, so that the absence of limbs must not be taken as indicating a relationship, but merely as a striking example of retrogressive convergent evolution. That is to say this similar feature, the loss of limbs, is a degenerative change that has appeared in a number of different families of lizards, through the operation of similar causes. This loss of limbs often does not occur in all the members of one family. Even in the same genus some of the species may have the limbs well developed, while others have them much reduced.

It has already been mentioned that there is one genus of lizards, the members of which are poisonous. This genus, *Heloderma*, contains only two species, which live in Mexico and Central America. These are the only known poisonous lizards in the world, so that there are no poisonous lizards in Australia. In spite of this quite a number of our lizards have a very bad reputation, and are supposed by many people to be very dangerous. The little wood-adder, *Gymnodactylus platurus*, is one of the geckos with a flattened somewhat leaf-like tail, and this and another gecko, *Eidura robusta*, living on old logs, are supposed to be very poisonous. But not only have they no poison, but they are very inoffensive and gentle creatures, and cannot bite hard enough to hurt a child. The same remarks apply to one of our legless lizards, *Lialis burtoni*, one of the most harmless creatures in the world. Several times in different parts of the country I have been told about a very dangerous snake found living in the district, and when a specimen has been forthcoming, generally in a much-battered condition, it has turned out to be this poor little *Lialis*. It is very hard to understand how such undeserved reputations have been made.

The order Lacertilia is divided into three sub-orders:—(1) the Geckones, comprising the single family Geckonidae; (2) the Lacertae, which includes eighteen families; and (3) the Chamaelontes, embracing the single family of the Chamaeleons.

As already mentioned the GECKOS are a large and widely-distributed family, containing 50 genera and about 270 species. There is a great uniformity of structure throughout the family, and the generic differences are of rather an unimportant nature, and refer for the most part to the structure of the digits. The skin is nearly always soft, and bears little granules or tubercles on the dorsal surface. The body is more or less depressed, and in some cases is bordered by cutaneous expansions, which enable the animal to adhere better to the vertical surfaces over which it runs. The lamellae on the digits are so arranged as to produce numerous little vacua, which are so effective that the gecko can not only climb smooth, vertical surfaces like the walls of a room, but can run across the ceiling, back downwards. The shape of the tail in geckos is subject to a great amount of variation, assuming some curious and grotesque forms, and in many cases being curiously large in comparison to the size of the body.

Many of the geckos are arboreal, living on shrubs or trees. Nocturnal in their habits, they generally conceal themselves under bark or stones in the daytime; but they are fond also of basking in the sun. Many have become the commensals of man, especially in India; some live inside the house, others outside. Of those living inside, one species may live in the walls, another in the roof, while a third may inhabit the dark cellars. They are very regular in their habits, always returning to their own special spot when disturbed or when finished foraging. At the same time of day, too, an individual may be seen in the same spot day after day, perhaps for months. Living on flies and spiders they perform good service for the houses in which they live. One species, rather large in size for a gecko, lives on young rats. They are absolutely harmless to man, their teeth being so small that they could hardly break the skin by a bite; yet, strange to say, some of them are much feared, not only in Australia, but in almost every country in which they live.

The eighteen families of the Lacertae are characterised by the presence or absence of osteoderms, *i.e.*, bony plates in the integument, the character of the teeth and tongue, and the structure of the skull.

The *Agamidae* is a family of old-world lizards most numerously represented in Australia. The great frilled lizard of Northern Australia, *Chlamydosaurus kingi*, is one of the most striking and best-known members. There is a large cutaneous frill round the neck, into which bony processes from the hyoid bone project like the ribs of an umbrella; indeed, the erection

and depression of the frill may aptly be compared to the opening and closing of an umbrella. When pursued this lizard assumes a semi-erect position and runs along on its hind legs. If closely pressed it turns at bay with its frill erected and its mouth wide open, and with its large teeth and powerful jaws it is an opponent not to be despised.

Moloch horridus, the "sand devil" of Western Australia, is a harmless little lizard of very fearsome aspect, through the great thornlike spines with which its head and body are covered. Its mouth is absurdly small; it lives chiefly on ants.

Lyriocephalus is a very interesting Agamid, in that it closely resembles a chameleon. This is hardly a case of mimicry, but simply one of convergent evolution.

Draco volans, the "flying dragon," is a pretty little Agamid inhabiting the Malay peninsula and the neighbouring islands. It is furnished with natural wing-like membranes that fold up like a fan; they may be raised up over its back like the wings of a butterfly; indeed, resting amongst the splendid foliage of its own native woods, with its wings over its back, it very closely resembles a large butterfly. These wings act as parachutes, hardly as organs of active flight.

The Iguanidæ is an American family of lizards closely related to the Agamidæ, the chief difference between them being in the nature of the teeth. In the Agamidæ the teeth are acrodont, *i.e.*, situated on the summit of the jaws, while the Iguanidæ have pleurodont teeth, fused to the sides of the jaws. This is a very large family with more than 300 species, the habits of which are very diverse. Some are terrestrial, some burrowing, some arboreal or semi-aquatic, while one, *Amblyrhynchus*, is semi-marine and feeds on seaweeds. Many members of this family are very large; *Iguana tuberculata*, of Central and South America, grows six feet in length, and weighs 30 lbs. It lives in trees, and when startled or in danger jumps into the water from overhanging trees, regardless of what may be beneath. Along some of the narrow, unfrequented creeks of the mosquito country they are very numerous, and according to a writer of repute, the unwary traveller in a canoe is met by a regular shower of falling iguanas, and stands a very good chance of getting his neck broken.

The family Scincidæ is a very large one, the members of which are only small or medium sized. It is a cosmopolitan family, most abundantly represented in Australia. Its members show a splendid series of gradations in the reduction of the limbs; even in the same genus, species occur with perfectly developed limbs, while others may have the toes reduced to four, three or two, the limbs being correspondingly smaller and smaller, till, in some species, they are quite functionless. This limbless or reduced-limb condition does not indicate any relationship within the family, but has happened independently

in the particular species, and is a very striking case of convergent retrogressive evolution.

The Pygopidae is a family of legless lizards confined to Australia and neighbouring islands. There are altogether about ten species, most of which are peculiarly snake-like in appearance. The Victorian species of *Delma* is supposed to mimic the young of the brown snake, *Diemenia textilis*, and it is indeed extraordinarily like it. Some of the species, as *Lialis burtoni* and *Pygopus lepidopus* are distributed over the whole of Australia.

The CHAMELEONS, with their casque-like skulls, peculiar circular eyelids and protruding eyes, with which they squint horribly, their prehensile tails, and hands and feet in which the digits are bound up into two bundles, three digits in one bundle and two in the other, thus converting the hands and feet into very efficient grasping organs, are rather widely separated in structure and appearance from the rest of the lizards. They possess very long and mobile tongues, which are capable of being darted out to a distance of six or seven inches to lick up insects and the like. They shoot their tongues with very great precision, hardly ever missing their object. The remarkable changes of colour of which their skin is capable are well known to everyone; they are easily kept in captivity, and make very charming pets.

GEOGRAPHICAL DISTRIBUTION. The study of the geographical distribution of animals teaches us broadly two main lessons: (1) It throws much light on the past geographical history of the earth, and (2) it is a great aid in understanding the relationships of various groups of animals. It is a very important factor in the elucidation of the problem of the evolution of animal life.

A natural family of animals is one in which all the members, the various species, are all descendants of common ancestors: represent, in fact, a branch of the family tree.

The present classification of animals, especially apart from the larger groups, is far from final, and is constantly undergoing revision as new facts are added, or previously known but misunderstood facts come to be better understood. And when we find a family of animals widely distributed, and more especially if this distribution is discontinuous, we should very closely scrutinise the various facts on which the relationship is based to make sure whether it is a natural family or not.

The Geckos, though a very large and widely-distributed family, are a natural family; one of the most independent and compact families of lizards. That is, while a study of their structure shows all their members to have a close structural similarity, they are not very closely related to other families of lizards. They are found to occur in practically all the

warmer parts of the earth. This wide distribution implies that they are an old family, and this is borne out by many archaic structures, such as amphicoelous vertebrae, which they present. They are indeed the oldest family of modern Lacertilia. Many points in the distribution of lizards support the idea that these so-called old families of lizards are indeed quite recent compared to many other groups of animals. The lizard fauna of Madagascar, for instance, is intimately related to that of Africa, and its lizards belong only to old families. Now, since Madagascar separated from the mainland not earlier than mid-tertiary times, it may be inferred that the newer families of lizards are of quite recent origin, and the old families comparatively recent.

As regards means of dispersal it is interesting to note that geckos are quite non-aquatic; no gecko will willingly enter water. But they can cling firmly to logs and timber, and can live without food and water for months, so that they are very well adapted for transportation from place to place on floating tree-trunks, etc.

It is a very striking fact that most families of vertebrates that have a wide distribution and do not cross Wallace's line (a line running between Bali and Lombok, then through the Straits of Macassar, east of Borneo, and on to the east of the Philippines), are absent from Madagascar. This is well illustrated by the Lacertidae and other families of lizards.

The Iguanidae, almost wholly American, with two genera in Madagascar, present a very peculiar distribution which, perhaps, can only be explained by the suggestion that it is not a natural family, but that the American and Madagascar branches present a case of convergent evolution, the two groups having been developed independently. It is very doubtful, too, whether some of the other large families like the Scincidae, with a very wide distribution, should be regarded as natural families.

The Chameleons have a distribution remarkably parallel with that of the Lemurs. The majority of the species are found in Madagascar, but a few are found also in Africa, Southern Asia, and the East Indies.

NOTES ON THE GENUS PSEUDOPHRYNE.

(By E. Clunies Ross).

Mr. Boulenger, compiler of the British Museum Catalogue of the "Batrachia Salientia," in a footnote to his descriptions of the species *Pseudophryne australis* and *P. bibronii*, expresses his uncertainty as to whether these two do constitute different species or are merely varieties of the one. It is not for one

of my limited knowledge to say whether or no the species are distinct, but I offer these notes to more advanced herpetologists for as much as they are worth as evidence for and against.

My first specimens of the genus were found at some ponds lying just N.E. of the Alt Street waiting-shed, Ashfield. The specimen first found was pulled up with the roots of some weeds and was several inches under ground. When unearthed it feigned death, but on being handled soon recovered and made vigorous efforts to escape. Since then I have found the species at Mosman and Lindfield, and always on the borders of stagnant pools. At Ashfield they were in the roots of weeds, and even in holes in the banks; at Mosman under stones, logs, and among reed debris; at Lindfield in similar places. At Ashfield, Lindfield and elsewhere I found them among their eggs, but at Mosman I once detected them among the egg-clusters of *Crinia signifera*. *P. bibronii*, as may also be said of *P. australis*, proved an excellent burrower, and seemed to dislike bright light. The amusing turtle-like waddle is also common to the two species, and both can undoubtedly swim. Some specimens in captivity use a little swimming bath, that has been built for them, much as a man might. The swimming is entirely voluntary, as it is impossible for the toads to fall in accidentally, and the water is too deep for them to sit in. It has been noticed, however, when *P. bibronii* or *P. australis* fall accidentally or are dropped into the water, that if they do not first get a breath they sink and would drown unless rescued. These little toads are not very agile creatures, and a great difference may be observed between the conduct of *Pseudophryne* and that of a *Hyla*, *Limnodynastes* or *Crinia*, when trying to balance themselves on a straw or thin stick. The frog will make a few business-like motions and be as firmly seated as is possible on such a rest, but the poor little toads, while clinging desperately with their hands, will make most pathetically unavailing attempts to gain a foothold, and frequently fall off after a piteous struggle to save themselves. It may be noticed that *Pseudophryne* does not give vent to prolonged croaking, five quick, sharp "crecks" being the average number; eight and nine are rare, and two or three more frequent.

My first specimens of *P. australis* were discovered at Mosman under a large stone on the banks of a small stream that runs down from the quarries above Sirius Cove. On being disturbed they pretended to be dead; but, like *P. bibronii*, soon revived. The most perfect instance of such acting that I have ever seen was performed by one of this species. I had been rooting about among some stones and violently dislodged one of these little chaps, who proceeded to "die" as I picked him up. The

body shrunk in, and slowly bent almost double, and the limbs, after a few spasmodic quiverings, set rigidly at most extraordinary angles—in fact the little actor looked most certainly dead. Thinking him quite dead, as he did not revive on handling, I put him down beside a little pool, when in a flash he was hiding amongst the reed roots on the bottom, thus giving a proof of his powers of swimming and of acting. In all their movements these funny little toads are most quaint and frequently most human, well repaying the trifling trouble of keeping them. To deal now with those differences of form and habits that it has been my fortune to observe. Taking first *P. bibronii* we may notice that they are to be found round the borders of stagnant pools, rarely in any numbers at the one place. Eight and ten are the largest numbers I have ever found together; solitary specimens or pairs are much more frequently met with. I have never found *P. bibronii* far from water. The colouring of *P. bibronii* seems to be fairly constant. A sooty black to dark brown above, bluish-white mottlings beneath, red or reddish yellow patch in the arm-pits, uniformly coloured hands and feet, are the characteristics of colouring that I have found constant in all specimens that were unmistakably of the species *bibronii*. I have, moreover, never seen these colourings blended with the characteristic *australis* markings. *P. australis* is found in large numbers, often thirty or more together, in the fallen leaves on the banks of small streams. Both at Lindfield and Mosman the habitats were practically the same. I have never found *P. bibronii* among these colonies of *P. australis*, though a solitary specimen of the latter may be found in the haunts of the former. *P. australis* is a great wanderer; specimens have been turned up half a mile from any water, and this accounts for the presence of *P. australis* in the home of *P. bibronii*, for in every case where one was found there was a colony within half a mile of the solitary one, while at Ashfield, where no such cover as at Mosman or Lindfield exists, *P. australis* is never found. To come now to the colouration of *P. australis*. In forty specimens from Mosman, taken from within a quarter of a mile of the haunts of *P. bibronii*, none had the sooty-black backs of the latter; the colour varied from almost bright-red in some to reddish-brown studded with bright spots in others. The arms and legs were of a bluish-gray colour, a tint never seen in *P. bibronii*, the mottling beneath was much the same as *P. bibronii*, but this latter never had the white patches on arms and legs so characteristic of *P. australis*, and one marking that I find invariable in the latter and wanting entirely in *P. bibronii* is the white tip to every toe and finger, sometimes small, but never wholly absent. The bright red markings, such as the red-arm-pitted toad never has, may vary considerably but never entirely leave the white-arm-pitted

ones, and this perhaps may have inclined many to the classing of the two as one species. In short, the constant conflicting characteristics seem to be of habit, occurrence and colouration; these may still be proved to merge in specimens other than those I have seen, yet in about eighty specimens of *P. australis* and forty of *P. bibronii* these respective characteristics have never been found to combine or vanish.

NOTES AND COMMENTS.

BALANCE SHEET.—The Balance Sheet of the Club, which was submitted to the Annual Meeting, and adopted, was most gratifying. For the benefit of Country Members who may not have seen it, it is herewith given:—Receipts—To balance from last year, £41 ls. 3d.; subscriptions for current year from Members and from Country Branches, £37 5s.; the sum of £1 15s. was paid in advance, whilst £18 10s. was received in settlement of arrears; sale of publications, £1 10s. 2d.; interest in Savings Bank, £1 9s. 8d.; advertisements in Journal, £5 15s.; total, £107 6s. 1d. Disbursements—Rent, £6 5s. 6d.; printing (Journal and notices), £31 4s.; letter box, G.P.O., £1; postage, stationery, advertising and cartage, £9 1s. 10d.; Savings Bank balance, £58 1s. 1d.; in hands of Hon. Secretary, £1 8s. 2d.; in hands of Hon. Treasurer, 6s.; total, £107 6s. 1d.

RARE BUTTERFLY RE-DISCOVERED.—Mr. G. A. Waterhouse, B.Sc., exhibited at the Annual Meeting of the Club a fine male specimen of the butterfly named *Hypochrysops apollo*, by W. H. Miskin, in the supplement to his "Catalogue of the Rhopalocera of Australia" (Brisbane, 1891). The type specimen (a male) was found by Mr. R. E. Turner, on the Herbert River, N. Queensland, pressed between the leaves of a book amongst a number of other undoubted butterflies. The specimen was much worn and damaged, but sufficient remains in the Queensland Museum, where the type is deposited, to show that the specimen exhibited, which was collected at Cape York, is identical with it. Thus after a lapse of seventeen years this handsome species has been re-discovered. Mr. Waterhouse remarked that his setting-boards contained two specimens of the undescribed female.

SCIENTIFIC INSTRUMENTS.—The Council desires to draw the attention of members and their friends to Messrs. Gibb and Beeman's advertisement on the back of the cover of this Journal. The firm has a large stock of all the optical requisites of the microscopist and naturalist, and their goods are of the best. Members requiring such materials would do well to apply for a catalogue.

Australian Naturalist.

VOL. I.

JANUARY, 1909.

PART 13.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—Thursday, December 3rd, 1908, the President, Mr. D. G. Stead in the Chair.

NEW MEMBERS.—Dr. G. Hurst, Mr. E. S. Edwards and Master Edwards were elected members of the Club.

PAPER.—Mr. D. G. Stead read an interesting paper on the "Life and Troubles of an Oyster," an abstract of which appears hereunder.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held in the Board Room, 82 Pitt Street, on Thursday evening, October 1st, 1908, Mr. W. W. Froggatt, F.L.S., in the chair.

NEW MEMBERS.—Messrs. Dene Fry, H. Coleman, and Dr. E. A. d'Ombraïn were elected members of the Club.

BUSINESS.—The business of the evening took the form of practical demonstrations. Mr. Harrison showed the instruments and methods used to properly blow a bird's egg; Mr. Waterhouse showed how to set a butterfly, and described the collecting apparatus used; and Mr. Laseron exhibited a home-made dredge, ingeniously constructed out of a kerosene tin and suar bag.

ORDINARY MEETING.—Thursday, November 5th, 1908, the President, Mr. D. G. Stead in the chair.

PAPER.—In the absence of Mr. Tillyard, who was to have read a paper on Dragon-flies, Mr. Finckh read some interesting notes on the common newt of Europe, which he had successfully imported for the first time to Australia.

THE LIFE AND TROUBLES OF AN OYSTER.

(Abstract of Lecture by David G. Stead.)

In this lecture, which was delivered by Mr. Stead at the December meeting, before a large attendance of members and friends, a short sketch was given of the life-history of the common New South Wales oyster (*Ostrea cucullata*, Born.), and its occurrence in the waters of Eastern Australia, while an insight was given into the numerous agencies set up by nature, to destroy the oyster at all stages of growth, and which bring about the necessity for the stupendous fecundity which we find in that succulent mollusk.

The geographical distribution was first dealt with, and it was stated that for practical commercial purposes the oyster was found to be distributed from about Gladstone, Queensland, on the north, to a little beyond New South Wales on the south. As regards local dispersal, the oyster was usually found in estuarine and harbour waters from about one-third tide (ebb), downwards. The zone was very limited in parts, but where the water was suitable, oyster beds might be continuous right down to a depth of three or four fathoms or even more. Mr. Stead stated that the oyster attained its greatest perfection in size and quality in the vicinity of (but not necessarily on) muddy bottoms, and that its local distribution was governed by various conditions, chief among which were the density of the water and suitability of the bottom. The anatomy was next discussed, as well as the food, and its method of obtaining the latter, reproduction, and the development from the egg onwards. As an illustration of the enormous fecundity of the oyster, the lecturer stated that if the progeny, for one season, of a pair of moderate sized New South Wales oysters were to attain maturity, and their progeny likewise, the product would be sufficient to cover an area larger than that of New South Wales (309,175 square miles). This led naturally to the discussion of the agencies at work in keeping down these numbers; which were, no doubt, in fact, the *reason* of this productiveness. Among the besetting influences at the outset were unfertilized eggs, unsuitable water and "catchment," and microscopic enemies. Afterwards came the fishes, boring mollusks, star-fishes, worms, boring sponge and others. Then there were passive resisters, such as marine growths of various kinds which enveloped the oyster.

Mr. Stead also referred to oyster culture as it exists on the coast of New South Wales, as well as in America and Japan.

The lecture was interspersed throughout with many beautiful and instructive lantern slides.

REPORTS OF EXCURSIONS.

TRIP TO KILLARA.

OCTOBER.—The monthly excursion was held on Saturday afternoon, the 10th October, to Killara, under the leadership of Mr. Waterhouse and myself. Mr. Waterhouse met about 25 members and friends at the station, and pointed out a nesting site of the little diamond bird in a stump hole at the top of the cutting in which the station is placed. The birds were busily engaged in feeding young. A short stop was made at my house, where the birds whose nests we were to inspect were laid out, together with their eggs; the party then proceeded to the bush. Immediately below my house a half-built

nest of the little native canary or white-throated flycatcher was inspected, while the birds uttered their little trilling call in close proximity. A little further on, the nest of a yellow breasted robin was seen, about fifteen feet up the trunk of a stringy-bark. There was one apple-green egg in the nest. In a little creek bed several nests were seen; that of the blood-bird in a small turpentine, the nest being so tiny that it was hardly visible even with glasses; that of a shrike-tit high in the leafy tops of a lateral branch of a tall white gum, with both birds busily building at it; that of a rufous-breasted thickhead in a turpentine, on which the bird was sitting; the tiny cradle of the blackcap or lumilated honeyeater, suspended in the outer leaves of a tall apple-tree; a second yellow robin's nest, this time within hands' reach; a nest of the oriole, and two of the lineated tit. A little further on, the wine-glass shaped nest of the little white-shafted fantail was inspected, and then in succession nests of the sacred kingfisher, white cheeked honeyeater, and chestnut-shouldered blue wren.

Mr. Waterhouse showed the larvæ of two species of skipper feeding on the sword grass, and the botanists and entomologists of the party made various finds. Mr. Hedley Coleman added interest to the outing by giving exhibitions of climbing with irons and rope ladder. On wending their way back, members found a billy boiling on a pleasant green, under the tall gums, and the afternoon tea provided by Mrs. Waterhouse and Mrs. Harrison was thoroughly enjoyed.

L. HARRISON.

AN AFTERNOON WITH A HAULING NET.

* NOVEMBER.—The excursion under the leadership of Mr. D. G. Stead, with the hauling net, which took place in the afternoon of Saturday, 14th November, at Rose Bay, was eminently successful. There was a large attendance of members and friends, numbering about 35. Operations were carried on with the special variety of hauling net, known in New South Wales as a "prawn net." As usually made use of this is what is termed a "sunken net," that is, it is so heavily leaded that it sinks to the bottom, the corks along the cork-line buoying it in a vertical position in the water. There is usually a fairly large bag or bunt.

This net was only 20 fathoms in length (1 inch mesh), and although only two hauls were made, the results were really astonishing. The leader made a special effort to see or to handle representatives of all of the species of fishes brought in by the net, but owing to the eagerness of many of those present to do likewise, as well as to the fusillade of questions which had to be answered, that was practically impossible. Notwithstanding this, however, the president was able to collect nearly

40 species of fishes, and *these were all represented in the first haul*. This speaks volumes for the fertility of the waters of Port Jackson (and incidentally of Rose Bay), as a collecting ground for the "aquarian naturalist."

A list of the species of fishes and crustaceans is appended. In addition to the crustaceans enumerated, many other invertebrates were taken. Some of the members present made collections for preservation, while Mr. Finckh and the leader took home a number of living examples for observation in aquaria—among them being a number of the curious crested blenny, *Bristiceps macleayi* (?=*australis*). These among others, are alive at the time of writing (9/12/08), and it is most entertaining to see them actually "walking" about on the floor of the aquarium, using their ventral fins, individually, as legs.

LIST OF FISHES AND CRUSTACEANS.

Collected from one haul of a small hauling-net (prawn-net), at Rose Bay, Port Jackson, by members of the N.S.W. Naturalists' Club, on the 14th November, 1908.

FISHES.

COMMON NAME.	TECHNICAL NAME.
Fiddler Ray	<i>Trygonorrhina fasciata</i>
Common Stingray	<i>Trygonoptera testacea</i>
Sandy Sprat	<i>Hyperlophus spratellides</i>
Estuary Catfish	<i>Onidoglanis megastomus</i>
Common Pipefish	<i>Stigmatophora argus</i>
Common Sea-horse	<i>Hippocampus novæ-hollandiæ</i>
Hardyhead	<i>Atherina lacunosa</i>
Sand Mullet	<i>Myxus elongatus</i>
Blackfish	<i>Girella tricuspidata</i>
Sydney Whitebait	<i>Chanda jacksoniensis</i>
Old Wife	<i>Enoplosus armatus</i>
Soldier-Fish	<i>Amia fasciata</i>
	* <i>Amia</i> sp.
	* <i>Amia</i> sp.
Trumpeter Whiting	<i>Sillago maculata</i>
Silverbelly	<i>Xystaema ovatum</i>
Trumpeter Perch	<i>Terapon quadrilineatus</i>
Snapper (Cockney)	<i>Pagrosomus auratus</i>
Blue-striped Goatfish	<i>Upeneus signatus</i>
Bar-tailed Goatfish	<i>Upeneus porosus</i>
Spotted Goatfish	<i>Upeneus tragula</i>
Little Rock-Whiting	<i>Odax balteatus</i>
Yellowtail	<i>Trachurus declivis</i>
Tailer	<i>Pomatomus saltatrix</i>
Small-toothed Flounder	<i>Paralichthys novæ-cambiæ</i>
Bridled Goby	<i>Gobius bifrenatus</i>
Goby	<i>Gobius frenatus</i>

Goby	<i>Gobius flavidus</i>
Goby	* <i>Gobius</i> sp.
Goby	* <i>Gobius</i> sp.
Fortescue	<i>Centropogon australis</i>
Common Flathead	<i>Platycephalus fuscus</i>
Crested Weedfish	<i>Cristiceps macleayi</i>
Oyster Blenny	<i>Petroscirtes anolius</i>
Frog-Fish	<i>Betrachus dubius</i>
Yellow Leatherjacket	<i>Monacanthus tomentosus</i>
Little Green Leatherjacket	<i>Brachaluteres tessellatus</i>
Porcupine-Fish	<i>Dicotylichthys punctulatus</i>

*I have not yet had an opportunity of examining these closely.

CRUSTACEANS.

Crab	<i>Nectocarcinus integrifrons</i>
Crab	<i>Thalamita sima</i>
Blue Swimming Crab	<i>Lupa pelagica</i>
King Prawn	<i>Penæus canaliculatus</i>
Shrimp	<i>Leander intermedius</i>
Sand Hopper	<i>Talorchestia quadrimana</i>
Fish Parasite	<i>Meinertia imbricata</i>

DAVID G. STEAD.

TRIP TO COMO.

DECEMBER.—The December excursion to Como turned out a veritable frost. Whether the unfortunate fact that Mr. Waterhouse could not lead was responsible, or whether members thought it too hot to face the train journey, I know not, but only four members turned out of the train to greet the hon. secretary at Como. We waited one train more to see if any belated members would arrive, but were disappointed, and had to face the excursion by ourselves. Entomological material was plentiful, but unfortunately, there were no entomologists in the party, which, as three-fifths of it had come purposely to glean some entomological knowledge, was distinctly unfortunate. Your hon. secretary, safe from contradiction, did his best to explain what came along, but his imagination failed him several times at the crucial moment. However, we found some Christmas bush, some fine bells, and some flannel flowers, and boiled a billy in a shady glen, and returned to the station almost satisfied with what had promised to be a far from profitable afternoon.

L. HARRISON.

THE KERMADEC ISLANDS.

In the issue of this magazine of January, 1908, we intimated the fact that a party of enthusiastic New Zealanders had formed an expedition for a twelvemonths' sojourn in the

Kermadec group, with the object of studying its fauna and flora. The party have now returned, and Mr. Tom Iredale, one of the adventurous band, has kindly furnished the following notes. Owing to unforeseen circumstances, the expedition was compelled to curtail its time on the islands for reasons explained by Mr. Iredale, nevertheless, excellent work was done in the way of biological collections, which latter have been entrusted to specialists for elucidation, and who will, in due time, make known the results of their investigations and research.

"The Kermadec group, though from their geographical position possessing interest, perhaps, unequalled by any other group in the Pacific, up to the end of 1907 remained entirely unexplored as to their fauna. To remedy this defect, more felt in New Zealand than in Australia on account of their close connection politically as well as geographically, an expedition was at that time organised. The drawback to all previous would-be investigators was the length of time necessary to devote to the study, viz., twelve months, the only means of communication being the government steamer, which calls once a year. It was considered that every branch of science should be undertaken, so that the time would materially assist rather than bore us. Though the plantlife had been previously systematically collected, it had never been attacked from an ecological standpoint, and such observations would be especially valuable to New Zealand students on account of the fact that many New Zealand plants occurred there. To assist in this branch, meteorological observations were to be taken, and the loan of a complete set of instruments were obtained from the government.

"Five of us landed on the 31st December, 1907, and left again on the 11th November, 1908, our projected stay being cut short owing to unforeseen circumstances in New Zealand requiring the despatch of the government steamer at that early date.

"The main island, Sunday, is simply a volcanic crater, a little over a mile in diameter, from the northeast and southwest of which run two rugged spurs. The crater ridge is of an average height of about 1000 feet, as are also the spurs, almost perpendicularly descending on the east side. In the floor of the crater are two lakes of a saline nature, whilst hot springs still indicate the presence of volcanic action.

"The whole of the island is densely bush-covered with nikau, tree-ferns and poutukava, the latter predominant and giving to the place an aspect strangely familiar to the New Zealander. The discovery of a very fine new tree-fern gave exceeding pleasure, being entirely unexpected owing to the previous collections being exhaustively made. This island being the resort, for breeding purposes, of multitudes of sea birds, some species unknown elsewhere as breeders, we anticipated much new in

this direction. Owing to the premature arrival of the *Hinemoa* we were unable to complete our observations, but we are able to add much to the previous knowledge regarding the avi-fauna.

"It was, however, among the lower forms of animal life that we expected to reap our richest harvest, and we were not disappointed. It will be some considerable time before our extensive collections will be worked out, but as we have obtained the co-operation of almost all the New Zealand specialists in the various branches, such as Dr. Benham, Mr. E. R. Waite, Prof. Chilton and others, the material will receive the attention it merits.

"Already the preliminary examination of some stuff has revealed much that is new, as well as many records of immense value to the zoo-geographer."

A BIRD PROTECTION SOCIETY.

(By Mr. L. Harrison.)

THE close of 1908 has brought with it the usual tale of newspaper paragraphs on pests—pests of grasshoppers, sheep fly, fluke, and other evils, which make the lot of the pastoralist and agriculturalist a very unhappy one. The pest question, as everyone admits, grows more serious every year, and every remedy, but the natural and obvious one, has been tried without avail. So it seems a good time to suggest, once more, that natural means should be given a chance.

All these pests have natural enemies in the shape of birds, and if the balance of nature had been left undisturbed by man, they would never have assumed their present magnitude. Birds are nature's police force, patrolling the face of the land, and keeping undesirables in check. But man, with his rabbit-poisoning, which kills a few rabbits and all of everything else, his careless shooting of birds unfit for food, his prejudice against the smaller insectivorous hawks because they look like their larger relatives, has reduced the birds, and in some parts of the state almost exterminated them.

With one or two exceptions perhaps, all birds should be protected, both on economic and on æsthetic—or if you prefer it, sentimental grounds. As a matter of fact they are protected, though most people will be surprised to learn the fact. We have the Birds' Protection Act of 1901, which provides all kinds of pains and penalties for the destruction of protected birds, and a framed schedule which means very little to the ornithologist, and absolutely nothing to the man with the gun or poison-cart. The administration of this Act is in the hands

of the already overworked police, who cannot, even if they have the time and wish, make themselves familiar with more than one or two of the scheduled species. Consequently, although breaches of the Act occur in dozens every day, prosecutions under it, if we except those for shooting duck and quail out of season, could be counted on one's fingers.

Education is what is needed to enforce the present legislation, which, with a few slight amendments, is good enough, and to teach thoughtless people the value of the bird-life they are carelessly destroying. We must teach the grown man the value of birds to his sheep, his grass or his crop, and before all things we must teach the child, so that when he becomes a man he may act more wisely than his father.

This teaching will be a big business, and will take a long time, but the sooner it is begun, the better. It is now proposed to form a popular society (to be called the GOULD SOCIETY, after the great historian of our birds) for bird protection. This society will charge a nominal subscription, say five shillings per annum, and will, if well enough supported, publish an educative journal on a small scale. It will undertake lectures to schools and similar institutions, and it will publish the facts of economic ornithology wherever it can get them printed. The work is a good work, and deserves the support of all humane people. Upon the amount of such support will depend the value of the society's work. An inaugural meeting will be called early in February, and the writer will be pleased to hear, before that date, from all persons who are interested.

NOTES AND COMMENTS.

Note.—Some time ago it was announced that an evening would be put aside for short papers, under the title of "A Night with the Nature Poets." It is proposed to hold such at the Monthly Meeting, to be held on Thursday, March 4. There is ample material for such a programme—in fact, the subject is practically inexhaustible. Members are specially requested to bear this in mind, and to unite in endeavouring to make the evening a success. The Council will be especially pleased to hear from those whose modest and retiring natures have, up to the present held them (so far as papers are concerned), in the thrall of silence at the meetings of the Club. It should be borne in mind that the NATURALISTS' CLUB OF NEW SOUTH WALES was formed for the purpose of encouraging and assisting *beginners* in the study of natural science, and not solely for the

reading of papers or delivery of lectures by the more advanced students. It is, of course, desirable that the latter should assist in this direction, but not, as in the past, that it should be left wholly to them. Plenty of our younger members possess the necessary ability, all that is lacking is the equally necessary effort—and here is an opportunity for them to *break the ice*.

FLIES.—Few people have any idea how numerous the Diptera is in point of species, or of its vast importance from both an economic and hygienic standpoint. Not only does the order include agricultural pests of the first importance, such as the Hessian fly, the fruit fly, and household pests, such as the house fly, but it also includes those insects which are directly dangerous to human life as carriers of disease, such as the mosquito, the tse-tse fly, and others. The number of species of flies already known to science is about 40,000, and it is estimated that when all the existing species become known, the number will reach a total of about 350,000! In the case of certain species of this order, the number of individuals in existence at any one time is enormous. Especially is this true wherever flies find favourable breeding places and plenty of food for their larvæ. Instances in point are the housefly and ferment flies, the latter being attracted to all kinds of decaying fruit, and to these may be added mosquitoes, which in some districts exist in vast hordes. The *Journal d'Agriculture Pratique* says it has been found that flies have a great objection to the colour blue, and if tenements infested with flies are washed with a blue, instead of a white wash, flies will desert the place. In support of this, an instance is reported by that journal: "A farmer had 170 cows, housed in different sheds; they were pestered with flies, but he observed that in one shed, the walls of which were a blue tint, the cows were not worried. He therefore added a blue colour to the lime with which he washed the walls of his buildings, and from that time the flies have deserted his buildings."

CAN PLANTS SEE?—Can plants see as well as think? The opinion of the president of the British Association for the Advancement of Science, Mr. Francis Darwin—that plants can remember and can develop habits, has been corroborated by Professor Wager, who proved to the scientists that plants not only can see, but can see well. He showed that the outer skins of many leaves are in fact lenses, very much like the eyes of many insects, and quite as capable of forming clear images of surrounding objects. This is the case with most leaves, but especially with those that grow in the shade. These lenses are so good, and focus the light that falls on them so carefully, that photographs can be taken by means of them.

The professor has taken a great many, and he showed some of the more remarkable. They included reproductions of photographs of Darwin and Huxley, in which the features were distinct and unmistakable, as well as direct photographs of landscapes and people. Even coloured photographs were exhibited, and like the rest they were remarkably clearly defined. Not only do these plant-eyes see well, but the rays of light, which by means of them are focussed on the interior of the leaf, are carried to the brain of the plant and affect the subsequent movements. It has been long known that the leaves of plants move so that they can get the maximum of light. It is now suggested how this movement is made possible, and the process is almost identical with the movements of animals. A close analysis of the eyes in plants, proves them, moreover, to be highly developed organs. *Apropos* of the above, we would recommend our readers to peruse S. Leonard Bastin's article, "The Intelligence of the Plant," in the November number of *The Pall Mall Magazine*.

BRITISH MACRO-LEPIDOPTERA.—Mr. Lindsay Symmington, of Looe, Cornwall, England, is anxious to enter into correspondence with an Australian naturalist, with a view to friendly exchange of named specimens. Should any of our members be desirous of obtaining British material for Australian, Mr. Symmington would be glad to reciprocate; specimens in papers would be preferred.

BIRD AND BUTTERFLY.—Early in December I was watching a pair of yellow-faced honeyeaters, near my home at Killara, feeding an almost full-grown pallid cuckoo. One of the honeyeaters gave chase to a common brown butterfly, *Heteronympha merope*, which it captured on the wing and fed to the cuckoo. I have never before observed this honeyeater to attack butterflies, and it raises a rather interesting point as to whether the foster-parent can have any knowledge of the different tastes of its cuckoo nestling, for cuckoos will devour several insects which no other birds will touch. I shall be glad to hear from any member who observes the yellow-faced honeyeater capturing butterflies for his own dinner.—L. HARRISON.

AUSTRALIAN HYMENOPTERA.—Mr. Rowland E. Turner, F.E.S., whom many of our members will remember, has been engaged, since he took up his residence in London, in the study of this important branch of our native fauna. Two papers entitled "A Revision of the *Thynnidae* of Australia" have already been published, and others are to follow. This is a branch to which many of our country members might advantageously apply themselves, not only in collecting specimens but in working out the life-history of our native species. The charm of a collection lies not only in the classification thereof—though that is essential, for one can't get on without names—but in

acquiring knowledge of habits and economy, dates of appearance, range and distribution, variation, seasonal changes and the like, and in each of these directions there is scope and *kudos* for the willing worker.

AUSTRALIAN MUSEUM.—The work of building the extension to the Australian Museum is proceeding apace, and should be out of the hands of the contractor long before the middle of the year. When completed and furnished, many valuable, rare, and interesting exhibits, which for some time have had to be kept under cover owing to lack of exhibition space, will be displayed, and will no doubt be appreciated, not only by students, but also by thousands of Australian citizens and visitors to our shores. One of the features in connection with the new wing, is an up-to-date lecture hall.

AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—This Association met at Brisbane this year, and was well represented by scientists from Sydney. Our old colleague and ex-President, Mr. Chas. Hedley, F.L.S., Assistant Curator to the Australian Museum, filled the position of President of the Biological Section. Other members of the Club who attended the session were Mr. A. H. S. Lucas, M.A., one of our former Presidents, Mr. A. R. McCulloch, and Mr. E. J. Goddard, B.A., B.Sc.

LITERARY WORK DURING 1908.—The year that has just closed has been, from a biological standpoint, an exceedingly busy one, and in this respect some of our own members have played a conspicuous and important part. In the zoological field of research, Mr. H. J. Carter, B.A., F.E.S., stands prominently forward with his papers, "Revision of the Australian Species of *Adelium*"; Mr. R. J. Tillyard, M.A., F.E.S., has continued his studies of our indigenous Odonata; and Mr. E. J. Goddard, B.A., B.Sc., who is now one of the Linnean Macleay Fellows, has commenced a series of papers under the title of "Contribution to our Knowledge of Australian *Hirudinea*." Messrs. Hedley, Rainbow, and McCulloch have also contributed their *quota* to the year's work. Mr. W. W. Froggatt, F.L.S., who has returned from an official tour round the world, has been too busy to put much matter through the press, but the current year will show that, in addition to travelling and investigating, he has been far from idle with his pen. In the domain of botany, Messrs. J. H. Maiden and R. T. Baker, have each contributed papers.

LOCUSTS AND THEIR FOOD.—At a meeting of the Entomological Society of London, the President, Mr. C. O. Waterhouse, F.E.S., exhibited photographs of a large locust (*Cantacanthacris rubella*) from the Congo Free State, which was captured holding a small mouse (*Leggada*?) with its front and middle legs, and was apparently devouring it. He read the following note from

Rev. M. H. Reid who found it:—"I never knew that a grasshopper would eat flesh, but seeing was to believe. I went to see some of the chiefs . . . during that time great swarms of locusts devoured every green thing. While looking at the locusts crawling over the native huts I observed the one I gave you. It held a mouse firmly, and had actually fastened its legs about the mouse, so that there was no way of escape Some of the locusts had great spiders and others great roaches (cockroaches), and in fact anything which would make food." The reading of the foregoing naturally created a discussion on the carnivorous habits of the *Acridiidae* it being considered a very unusual phenomenon. It may be pointed out in connection with this, that locusts, in plague times, when they have denuded a district of its herbage and foliage, have been known to devour the dead bodies of their comrades, and also to enter houses and eat textile fabrics; even boots have been recorded as contributing to their food upon such occasions.

EMUS AND PRICKLY PEAR.—According to the *Pastoralists' Review*, the spread of the prickly pear in the eastern states of the Commonwealth is largely influenced by emus. The birds are very fond of the fruit of the pear, and eat it in large quantities. Then they parade about, spreading the plant in clean country, as their excreta is a mass of pear seeds. In this way, the journal quoted, points out large areas of good country can be spoilt in a very short space of time.

PRICKLY PEAR AS A MOSQUITO PREVENTIVE.—M. Sauzeau de Puybernean, a French physician states that the leaves of the common prickly pear, if chopped up and thrown into water will prevent mosquitoes breeding for weeks or months. The resinous mucilage of the leaves floats on the surface of the water and stops the breathing tubes of larvæ (wigglers) and pupæ. Furthermore, in stagnant, foetid water the prickly pear juice has the property of absorbing the gases of decomposition.

NEW FOSSIL MAMMALS FROM EGYPT.—The expedition of the American Museum of Natural History to the famous fossil beds of Fayûm has been highly successful. Prof. Osborne has issued a short paper in the *Bulletin of the American Museum of Natural History*, Vol. IV., March 25, 1908, describing some of the more remarkable discoveries. Two new forms, unfortunately represented only by portions of the lower jaw, are so peculiar that their ordinal positions remain uncertain. One of these is named *Ptolemaia lyonsi* and is taken as the type of a new family Ptolemaiidae. It is even stated that it possibly represents a new order. The other, *Apidium phiomensis*, new genus and species, "was evidently a small omnivorous or frugivorous form, with partly cuspidate teeth;" but at present its precise affinities are unknown. Two other fossils are described, representing new genera (*Phiomys* and *Metaphiomys*) of rodents, placed in the family Eomyidae.

THE
Australian Naturalist.

VOL. I.

APRIL, 1909.

PART II.



NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt-street on Thursday evening, February 2, 1909, the President, Mr. D. G. Stead, in the chair.

ELECTIONS.—Mr. Edwin Cheel was elected an ordinary, and Masters Clark and Levy, junior, members of the Club.

LECTURE.—Mr. W. W. Froggatt, F.L.S., gave an interesting lecture, "Natural History Notes on My Recent World Tour."

SPECIAL GENERAL MEETING.—Prior to the March Ordinary Meeting, a Special General Meeting was held to consider certain alterations and amendments to the Rules.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held on Thursday evening, March 4, 1909, the President, Mr. D. G. Stead, in the chair.

ELECTION.—Mr. Oschaatz was elected an ordinary member of the Club.

BUSINESS.—"An Evening with the Nature Poets." Mr. Thackeray opened with a paper on "Tom Hood as a Nature Poet," and Messrs. Stead, Froggatt, Rainbow, and Harrison also contributed.

NATURAL HISTORY NOTES ON MY RECENT
WORLD-TOUR.

(By Walter W. Froggatt, F.L.S.)

My first point of call was Honolulu; in the Hawaiian Islands both the fauna and flora have almost vanished. It is said that in the early days when the English and American ships first visited them, they were more or less clothed with forests, but these have long since vanished, and the present flora in the "Garden of the Pacific" consists of a luxuriant growth of introduced plants; on the waste lands, lantana, guava, several prickly acacias, and the larger algeroba trees, while in the parks and gardens the Royal Palm with its beautiful white stem takes the place of honour; yet everything seems to thrive, from our blue gums and she-oaks to the mango. The animals found here are wild deer, originally sent to the King of Hawaii by the Mikado of Japan, then came the rat, and the mongoose introduced to kill the rats.

Finding the rats too active the mongoose has turned its attention to the introduced Californian quail, pheasants, and domestic poultry.

There are many of the typical sea birds around the coast, but of all the small native birds very few are left, chiefly because the naturalists and collectors hunted them for specimens. Among the most interesting is *Melithriptes pacifica*, a little bird that had the misfortune to have a yellow feather under each wing, for the yellow-feathered were used by the Hawaiian kings in making their royal war-cloaks. The great cloak of Kamehameha I. buried with the last of the kings, was over eleven feet long and four feet wide, so you can imagine how many birds died to make such a cloak.

The two common birds one sees about the plantations are the rice or weaver birds (*Munia risoria*) introduced from the Malay Peninsula about 1878, and now a pest in the Chinese rice fields, and the well-known Indian minah, which is more a pest than useful in the gardens.

Among some of the most noticeable insects are the following:—A large carpenter bee (*Xylacopa acutipennis*), introduced from North America; it finds the wooden verandah posts admirable places in which to bore its burrows when nesting, and often damages them to such an extent that they want renewing. Fuller's rose beetle (*Aramigus fulleri*) from the States, and the Japanese leaf beetle (*Adorctus umbrosus*) are great pests on foliage, and do much harm to roses. The Bishop Museum, endowed by Mr. Bishop in memory of his wife, Princess Berenice Pauahi, has a very fine collection of the zoology of the Islands; and one of the finest works on Island faunas, the "Fauna Hawaiensis," has been published with the aid of the trustees of this Museum.

In California my headquarters were at Alameda, a suburb of San Francisco, where my old friend, Prof. A. Koebele, resides, and thus I had the opportunity of seeing some of the natural history close to the town. Going along in the train I noticed the great swarms of the white cabbage butterflies (*Pieris brassica*) that infested the market gardens. Koebele was catching gophers in his garden one afternoon: the gopher is a burrowing rat-like animal that does a lot of damage in cultivated lands by eating off the roots of plants; he was doctoring carrots with poison and burying them where he located the burrows. The farmers in the west use potatoes poisoned and dropped into the burrows of gophers and ground squirrels. There was a very pretty little ground squirrel common in the sandbanks along the roads around

Sacramento, and further north one species is often nearly as bad as our rabbits in the wheat fields. Coming into the garden one afternoon a curious little thing flashed past me among the shrubs. Was it a moth or a bird? And then it darted up and I saw my first humming bird. I had seen hundreds of stuffed humming birds; the great Gould collection in the British Museum; but this was a revelation. There were many later on among the flowers, not the brilliantly tinted forms of tropical America, for as you know, this group ranges from the United States down to the barren rocks of Terra del Fuego. I saw many different humming birds afterwards in Mexico, and the West Indies, where when sitting on a flower-covered verandah they would be so intent on sucking up the honey that they would hover over a flower within a few inches of one's head; but I never forgot my first humming bird. They are very noisy, pugnacious little atoms, always challenging or scolding as they flit about among the flowers, or dart straight upward as they often do when alarmed. The Island of Trinidad is called the "Home of the Humming Birds" from the numbers found there, but as yellow fever had broken out a few days before we called there, no one was allowed to land.

At Watsonville I had a long day's drive through the Pajaro Valley, once a great redwood forest, now transformed into apple orchards. I saw many birds along the road, among them great flocks of blackbirds; one species had a bright red patch on each wing. At a little village in an oak forest near Santa Rosa, all the scrub oaks were covered with smooth brown cynips galls as large and round as an ordinary apple, and I was interested in watching the large grey woodpecker drilling holes in them, and obtaining the little fat grubs in the centre. I might here note the two characteristic groups of oaks that are found in California: the "live oaks," as the evergreen oaks that do not shed their leaves are termed, and the other deciduous species that are the most abundant. When at Los Angeles in Southern California I spent a Sunday on Mount Lowe at an elevation of about 6000 feet; in the oak and pine forests surrounding the hotel were dozens of large grey squirrels (*Sciurus carolinensis*), and so tame that they would run up and feed out of your hand. I found them just as friendly later on in the park round the Agricultural Department in Washington, where they are protected.

I did not have much time for collecting specimens, but one Sunday had a delightful day in the woods of Virginia under the guidance of Messrs. Candell and Knab, of the National Museum. One of the most striking things besides the won-

derful autumn tints of the forest trees in this, the fall of the season, ranging from every shade of red and yellow, was the numbers of leaf-eating caterpillars that one could find feeding quite openly upon the foliage, so different from the retiring habits of our *Lepidoptera*. There is one, a large, "woolly bear," that one often sees crawling along the paths (*Pyrrharctia isabella*), covered with black hairs, except on the anal segments, where the hairs change to dull red. At Cornell University Prof. Comstock, showing it to me crawling along, said the extent of the red hairs was very variable, and the children say that on finding one they can tell by the length or otherwise of the red pubescence "whether it is going to be wet."

Through the Southern State from Washington one passes through great cypress swamps before reaching New Orleans; and many of the trees right on into Texas are covered with Spanish moss (*Tillandsia usneoides*), hanging down in great trailing mosses, and often quite covering the foliage.

Though the mocking birds are found in many parts of the States, it was at Baton Rouge where I first noticed them, and recognised their notes; in many of the States they are considered such useful insectivorous birds that it is illegal to keep them in captivity. In Mexico, however, it is the favourite cage bird, and in the better class of Mexican houses there are often a dozen or more cages of them hung along the verandah.

Cotton is grown all through the South into the dry districts of Texas, where in a bad season the fields have a very poor crop. This was pointed out to me as "Bumble Bee Cotton"—a Texan joke. The bushes are so short and stunted that the Bumble Bees can stand on their hind legs and suck the honey out of all the flowers.

At San Antonio I found the "curio shops" full of the shells of the pretty little Armadillo (*Tatusia novemcincta*) for sale as lady's work baskets, the long, slender tail being curved round for a handle; if this fashion continues, the curious little animal will soon become extinct. Another thing very noticeable here was the quantity of "rattles" from the tails of the rattlesnakes; these were made into trophies and hung on the walls of saloons, or sold in the shops, showing that these snakes must have been very numerous in old days.

The "Turkey Buzzards," of which there are two species, one with a red and the other with a black head and neck, range all over the South, through Mexico and the West Indies. In Jamiaca the negroes call them "Jimcrows." You can imagine a heavy, clumsy bird the size of a large fowl, with the head and neck of a turkey and the beak of an eagle,

and you have the "unclean beast," the scavenger of the country. They sit about on the fences, hang about the back yards, and eat anything. In the Mexican towns they generally roost at night on the roofs of the churches, and at Vera Cruz they covered the whole dome of the Cathedral flying in at dusk and fighting for the best places even to the cross on the summit. They are protected in the United States, but in Jamaica they are said to kill young chickens, and are often shot in consequence.

Professor Koebele and I used to get quite a number of fine hawk-moths and other insects in the paved court of the Iiterbuzzdie Hotel. Here there was a big electric light, and we used to get down before the sweepers cleaned up the place; during some of our tramps through the suburbs or little villages we often found interesting specimens on the walls where the electric lights were fixed. In the central parks, common in all Mexican towns, we also found very fine frog-hoppers, belonging to the *Membracidae*. In the argave plantations, a few miles out of the town, we captured a butterfly (*Hesperid*), the larva of which has the curious habit (for a butterfly) of burrowing in the fleshy leaf and pupating there when full grown.

In the tropical country, towards Merelos, I saw the immense green "Katydid" fly up from the grass, as we were in the train; and on the same trip I saw the beautiful "Red Cardenal," one of the finches that has a wide range to the Southern States. It was in the Southern portion, however, below Vera Cruz, where I saw the rich tropical forest and the great owl butterfly, the great *Morphos* and other South American types, but I also was almost eaten alive by a small forest "tick" that did not remain in the skin, but simply raised little blisters wherever he sat down, and which lasted for weeks. There were puma and deer in the forest, but we did not come across any.

The open spots were carpeted with a delicate sensitive plant that folded up its leaves so rapidly that one's footsteps made a regular print whenever he walked through it. There were ants of all kinds, and great wasp nests in the trees that I nearly came to grief over as I went to examine one, thinking it was a termites' nest. The fire-flies swarmed at night, and in the early morning the forest resounded with bird notes. In Cuba, birds are not particularly numerous, but I was not in the northern forest-clad country. In the Isle of Pines, on the northern side, there are immense flocks of large green parrots, that are caught and exported to the United States. There is a great quantity of level jungle country through the centre of Cuba, where the parasitic

Bromelias cover the trees like staghorn ferns, and apparently often kill large forest trees by force of numbers. The island is very rich in palms, and is the native home of the beautiful Royal Palm (*Creodoxa regia*). The leaf-cutting ants are one of the most serious pests to the farmer, and an army of them will in a single night reduce a vegetable garden to a dust-heap.

(To be continued.)

REPORTS OF EXCURSIONS.

TRIP TO TEMPE.

FEBRUARY.—Dull rainy weather kept some members away, but about a dozen members and visitors were present. Mr. Rainbow having sent word he regretted being quite unable to be present, Mr. Gurney led the excursion. Insects and botanical specimens such as the district yielded were obtained. Some interest was taken in the curious seed-like galls made by a coccid insect (*Cylindrococcus spiniferus*). These galls, which develop to about $\frac{3}{4}$ in. in length, are found only on *Casuarina*, and are very suggestive of the seed cones of this plant. The soft fleshy insect causing the gall lies in a cylindrical cavity towards the centre of the latter. In the walls of many of the galls several tiny fleshy Hymenopterous grubs were found feeding in the woody tissue.—W. B. GURNEY.

VISIT TO MR. FINCKH'S AQUARIUM.

MARCH.—This visit took place under ideal weather conditions, was very well attended, and was highly successful from every point of view. Mr. Finckh's fine and well-kept collection of aquatic animals and plants was viewed under the best of circumstances, proving a great attraction to the visiting members. Among the aquatic plants were to be seen beautiful examples of species of *Myriophyllum*, *Ceratophyllum*, *Elodea*, *Nitella*, *Chara*, *Azolla* and many others, while prominent among the representatives of fish life were the exotic Pallas' Gourami (*Osphromenus trichopterus*) only recently introduced to this State, Fighting Fish (*Betta pugnax*), Japanese Rice Fish or Medaka (*Oryzias latipes*), Loaches from Japan and Europe, European Gudgeon (*Gobio fluviatilis*), the beautiful Golden Ide or Orfe (*Leuciscus idus* var. *orfus*) which, as far as I know, is the first in New South Wales and the common American Catfish (*Ameiurus nebulosus*). Mr. Finckh's col-

lection also contains many indigenous kinds, and amongst these, I think, pride of place must be accorded to a beautiful example of the Freshwater Perch (*Percalates fluviatilis*) which, in a beautiful jar and surrounded by some exquisitely beautiful water plants, formed a veritable picture.

It is to be hoped that Mr. Finckh and other members who keep aquaria, will lose no opportunity of obtaining photographs of our indigenous fishes, taken in a living state through the aquarium walls. At present we are sadly lacking in these.

At the conclusion of the visit, and when afternoon tea had been partaken of, the leader expressed the thanks of the members to Mr. and Mrs. Finckh for the kind way in which they had been entertained.—DAVID G. STEAD.

THE BALANCE OF NATURE.

(By P. A. Gilbert.)

THE expression "upsetting the balance of nature" is the outcome of loose, unscientific reasoning, in relation to the displacement of some of our indigenous fauna, by exotic species such as rabbits, foxes, sparrows, etc., as well as other agencies, and is used in discussions on the preservation of animal life, more from ignorance of the fundamental laws of nature, than for any other cause.

We can see the incalculable harm to some of our indigenous animals, and their speedy retreat before the advance of the hardy exotic species now existant. But the marvellous fecundity of the latter and the wonderful rapidity of their increase, is but a transitional stage of their existence as survivors of the fittest—one species asserting its right to live where its competitor fails.

The history of the past exemplifies the fact, that nature is inexorable in her preservation, or extirpation, of species according to their ability, or inability, to adapt themselves to the requirements of a changed environment; and the present and future will alike provide for those organisms that can best exist.

In his primitive state it was necessary for the existence of man, that he should be gregarious in habit and small in number; and the vast tracts of land which he now occupies in a civilised state, were once a part of the forests wherein he hunted in quest of his daily sustenance. In the transition of man from his primitiveness to a civilised state, he has left extinct, the contemporaries of his cave-dwelling days, the mammoth, woolly-haired rhinoceros, and many other authenticated animals. And here, may we ask, are the teeming mil-

lions of humanity which now exist to be considered to have "upset the balance of nature" because the physical and psychical evolution of man from his primitive state has resulted in the present successful social organisation? If so, the logical conclusion is, that nature has been upset ever since the dawn of civilisation.

The virility and intelligence with which nature has endowed man, led him to land on this island continent, and he has since all but exterminated its aborigines; indeed, in Tasmania that result was achieved several decades ago. We do not hear anything about "upsetting nature's balance" in connection with these interesting varieties of humanity, which, if they still existed, would have been among the most valuable subjects of comparative anthropology.

The inevitable result of the necessities of man compared with other organisms, emphasises the fact, that if the one exists the others must perish, unless perchance, they can live in unison with man. For the utility of things is estimated from man's standard, and he considers everything subservient to his own desires.

It is just as much a law of nature for one organism to increase, as it is for another to decrease. In the first case the means of existence are favourable, whereas in the other it is unable to comply with the conditions of its environment. The agencies effecting any favourable or detrimental conditions are a part of nature's process; and the extinction of a species brought about by the operations of man is within the laws of nature, inasmuch as he is a child of nature's evolutionary procession. The fundamental law is, that each organism must increase and multiply as rapidly as possible if it is to maintain its specific predominance in the struggle for existence, and its concomitant the survival of the fittest.

The operation of nature's laws in the production of myriads of grasshoppers, is a vindication of Darwin's averment, that "lighten any check, mitigate the destruction ever so little, and the number of the species will almost instantaneously increase to any amount," and thereby showing, that where the means of existence are favourable, the species tends to increase.

This favourableness is the direct result of the work of man. The laws of nature working within and without man have caused him to bring about a change in nature and render her more amenable to his needs, and in so doing have incidentally bettered the conditions of the grasshoppers in the laying out of pasturages, etc., and the indiscriminate destruction of birds inimical to their increase.

Huxley says, "The laws of nature are statements of tendencies, and if one law expresses the truth, that tigers, which kill and eat, will live and wax fat, another expresses the converse truth, that if tigers do not kill and eat they will wax lean, and die. The results are consequences of two modes of action, both of which are in accordance with natural law (or they could not occur) and not rewards or penalties."

The same argument applies to the overwhelming increase of the introduced species over those of our indigenous ones that are unable to compete with them. If their increase is not co-equal with those of the exotic species "they will wax lean" in maintaining the circumstances of the existence.

From the scientific, ethical, and aesthetic standpoints, the preservation of useful animal life should be encouraged; not because the "balance of nature is being upset," which has no meaning so far as the evolution of life is concerned, and only obscures the true reason why these animals should be protected; but because it is of scientific import to the welfare of man; has expression in a profound ethical ideal, viz., the prevention of a ruthless and inexplicable destruction of useful animal life, carried on under the name of sport; and undermines the cultivation of a true aesthetic sense by supplying the idiosyncrasies of "modern" fashion, with the means of embellishment and ornamentation which are in no whit different from those indulged in by a Red Indian or South Sea Islander.

FOODS OF AUSTRALIAN ANTS.

(By W. B. Gurney.)

SOME conversation arising at the Tempe excursion on the food of ants it occurred to the writer that little data had been recorded, and I therefore suggest this question as a subject for investigation by members of the Club. We know the common "gravel nest" or "meat ant" (*Iridomyrmex detectus*) feeds on flesh, such as dead snakes, lizards, birds, etc., also insects, "honey dew," flower nectar, and the like. Similarly our "Bulldog Ants" (*Myrmecia spp.*) feed on nectar, insects, etc.; the "Sugar Ants" (*Camponotus spp.*) like sweets, and the common black "house-ant" (*Iridomyrmex rufoniger*) attacks many things; but we have little or no record of the proportion of animal and vegetable matter in their diet, what their natural staple foods are through different seasons of the year, or what the larvae are fed on. It is, therefore, requested that members forward notes on this interesting subject,

Observations should be made of animal matter, seeds or other vegetable matter carried, collected or fed upon by ants. Samples of both the ant and its food should if possible be obtained, and the specimens or notes made thereon could be forwarded to me. This information would then be tabulated and printed in THE AUSTRALIAN NATURALIST from time to time, and would serve as an acknowledgment to those sending information, and make the whole available to all members.

Over 550 species and varieties of ants are recorded from Australia, some of which are extremely plentiful. By these records some knowledge will be gained of the immense part played by the ants in our bush—as scavengers and disseminators of seeds and fungi, their effect on plant life, their importance in checking or aiding the increase of other insects—and doubtless many other points to be revealed by observation.

FLEAS.

(By *W. W. Froggall.*)

FOR the study of fleas it is desirable to collect them in various parts of the world from their hosts—mammals and birds. The Hon. C. N. Rothschild, Tring, England, who is studying this group of insects has forwarded directions how to collect and preserve specimens. These directions are printed below and may be of use to those wishing to collect and study these parasite insects.

INSTRUCTIONS.

Fleas are found on mammals and birds, in the hair or feathers. They are also found in their nests or holes. As soon as their hosts get cold, the fleas leave it. Should the host be small, place it in a small box or linen bag, with a few drops of chloroform or benzine. The fleas will then be found dead on the bottom of the box or bag, or amongg the hair, when the same is turned back. If the flea be touched with a small brush, moistened with spirit, chloroform, or benzine, it will stick to it, readily floating off in the tube of preservative. The best preservative is 50 per cent. of alcohol. Acetic acid can with advantage be substituted for this, when the specimens have not got to travel a long way. The action of the acid, however, destroys the corks of the tubes in a short time. Each tube of fleas should be labelled with the date, locality, and name of the host from which the fleas were taken. If the name of the host on which the fleas

were found is not known to the collector, the host itself should be sent with the tube. A number corresponding to one on the host should be attached to the tube. Skins of hosts sent for identification only will, if desired, always be returned. If it is impossible to send the host, the name of the person possessing it should be given, in order to apply to him for the name. Each tube should contain the fleas from one host only. A good method of recording data is a label written in pencil and put inside the tube. Large mammals cannot well be treated with chloroform or benzine. If the hair of these, however, be turned back shortly after death, the live fleas will be seen running about. These can be killed by touching them with a brush moistened with spirit, chloroform, or benzine..

Small mammals can be treated in the same manner as large ones, if the first method is found to be too cumbrous. Another very good way to catch fleas living on mice and other small mammals, is to place the live mouse in a bag. The animal should then be killed by breaking its neck from outside of the bag, and searched in the manner previously explained. Traps should only be used in which the mice are caught *alive*. Bats, rodents, and small mammals generally, are all good hosts. As many specimens as possible should be sent, there frequently being several species of flea on one host.

FLEAS IN BIRDS' NESTS.

Take the nests of birds as soon as the young have left them. Place the nest in a box, preferably one lined with white paper, and with a glass top. From time to time the nest should be slightly damped. The fleas will frequently keep emerging from their pupæ in the nests for six weeks or two months after the nest has been taken. The live fleas can be taken off the sides and top of the box with a camel's hair brush dipped in chloroform or benzine. ♀

"CHIGOES."

"Chigoes," which are highly specialised fleas, occur on mammals and birds in warm countries. The females, which often have the appearance of a small wart, attach themselves to the more naked portions of their host, remaining firmly fixed in the skin. Mammals preserved in alcohol often yield examples of these insects. Chigoes are of great interest, and should be carefully collected.

Mr. Froggatt, Government Entomologist Department of Agriculture, Sydney, will be glad to receive and forward specimens, and will pay 3d. apiece for such specimens, other than house, dog, cat, rat, or mice fleas.

NOTES AND COMMENTS.

THE SERRICORNIA.—Mr. Hedley Coleman, one of our members, is desirous of corresponding with country friends and collectors *re* the above, and will be grateful for specimens of Elateridae and Buprestidae. In exchange he offers duplicates of the above, or specimens of other families. Correspondents are requested to carefully localise and date specimens forwarded. Mr. Coleman's address is "Halghor," Killara Avenue, Killara.

PRESERVATION OF FROGS FOR MUSEUM PURPOSES.—In view of the increasing interest that is being taken in our reptilian fauna a few notes on this subject may not be out of place. The preserving outfit is simple, consisting of a glass syringe and two wide-mouthed jars, one containing 75 per cent. alcohol for hardening the frogs, while the other is a killing bottle. This last has a wad of cotton-wool on the bottom, which is saturated with spirit and covered with a sheet of blotting paper. This keeps the frogs from coming into contact with the spirit, which will act very severely on their skin and cause them to contract and so spoil them for the next operation. When dead the frogs should be at once removed from the killing bottle, and strong spirit forced into the lungs by opening the mouth and inserting the syringe into the glottis. If done with care, this will give the frog a nice natural shape, and at the same time preserve it thoroughly internally. It may then be transferred to the preserving jar, or better still, to a shallow dish, and the limbs should be placed in convenient positions for the final hardening. Owing to the great variability of the colour-marking and other characters of frogs, as many of each species as possible should be preserved, but care must be taken that too many are not placed in the one jar of spirit (alcohol is far better than formalin) or the lot will soften and decay, and thereby waste both time and patience.—DENE FRY.

ANSWERS TO CORRESPONDENTS.

[The Publication Committee will be pleased to answer questions, asked by country members, in the pages of this journal. All communications should be addressed to the HON. EDITOR.]

H. E. BAKER, Public School, Gundy.—Larvae and imago of the "Weed Weevil," *Lixus mastersi*, Pascoe. Mr. Froggatt, in "Australian Insects," says: "The weed weevil is very common in neglected gardens, as it larvae feed in the roots of *Amaranthus* and *Chenopodium*, causing them to swell out with cylindrical galls."

ERRATA.

In our report of the Club's *Conversazione*, the name of Mrs. W. W. Froggatt is inadvertently omitted from the ladies' committee. This is regrettable, as Mrs. Froggatt worked hard, not only at the *Conversazione* itself, but also during the day, in preparing for the function. Miss Swan, although not included in the committee, rendered valuable assistance, and her voluntary efforts were much appreciated. The foreign and Australian *Cicadae* recorded as coming from the Technological Museum were exhibited by Mr. Froggatt, and the models of flowers and fishes, as also the vegetable sheep from New Zealand, were sent by Mr. R. T. Baker. In addition to other exhibits, Mr. D. G. Stead also displayed a fine collection of crustaceans, star-fishes and sea-urchins. On page 183, for "Miss Edson" read "Mrs. Creagh." In the last paragraph on page 183, read "PRESERVATION" for "PRESENTATION," and on the following page for "V. Le Gay Brereton" read "J. Le Gay Brereton." On page 174, line 11 from top, read "Audobon" for "Anderson."





THE
Australian Naturalist.

VOL. I.

JULY, 1909.

PART 15

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The ordinary meeting was held at 82 Pitt-street, on Thursday evening, April 2, 1909, the President, Mr. David G. Stead, in the chair.

NEW MEMBER.—Mr. A. J. Vogan, F.R.G.S., was elected an ordinary member of the Club.

LECTURE.—Mr. L. Harrison delivered a lantern lecture, "Pictures of Australian Bird Life," illustrated by a beautiful series of bird photographs taken by Mr. A. H. E. Mattingley, C.M.Z.S., of Melbourne. On the motion of Dr. Hurst, seconded by Mr. Steel, a special vote of thanks was carried to Mr. Mattingley for his kindness in forwarding the slides for exhibition before the Club.

EXHIBITS.—Mr. Harrison exhibited the eggs of the great bower bird (*Chlamydodera nushalis*) from Northern Territory.

ORDINARY MEETING.—The Ordinary Meeting was held at 82 Pitt-street on May 6, 1909, the President in the chair.

NEW MEMBERS.—Miss Edwards and Masters E. C. Ross and A. H. Perritt were elected ordinary and junior members respectively of the Club.

BUSINESS: *Exhibit Evening*.—Mr. H. E. Finckh showed two curious plants, the Rose of Jericho, from Arabia, and Resurrection Moss, from Mexico. Mr. J. R. Garland exhibited eggs of Australian hawks, and the type egg of the Australian pratiniole (*Stiltia isabella*), also flowers from West Australia and Kosciusko. Mr. D. G. Stead exhibited a fish *Terapon unicolor*, from the Corella Bore, and an interesting discussion took place as to the possibility of the fish having come up the bore. Mr. E. Cheel showed a series of seven species of puff balls from the Sydney district. Mr. L. Harrison and Mr. C. Coles showed a collection of New Guinea birds made by Mr. Donald Mackay on his recent exploring expedition.

ORDINARY MEETING.—The Ordinary Monthly Meeting was held at 82 Pitt-street on June 3, 1909, the President in the chair.

NEW MEMBERS.—Mr. R. J. Geddes was elected an ordinary, and Masters Eastway and Hamblin, junior, members of the Club.

HONORARY MEMBER.—Professor David Starr Jordan was elected the first Honorary Member of the Club.

BUSINESS.—Mr. Froggatt, F.L.S., continued his lecture, "Natural History Notes on My Recent World-Tour," and an interesting discussion followed.

EXHIBITS.—Mr. Stead exhibited a fire fish (*Pterois zebra*), from Pt. Macquarie. Mr. Harrison exhibited educational leaflets of the National Association of Anderson Societies of U.S.A.

NATURAL HISTORY NOTES OF MY RECENT WORLD TOUR.

(By W. W. Froggatt, F.L.S.)

(Continued from Page 166.)

CUBA is rich in fire flies, one of which is like a large click beetle, with a lamp on either side of the thorax. I caught a number of fine butterflies at Banos on Sunday morning, mostly allied to South American forms. In Jamaica there are many little birds in all the gardens and open forest, and Mr. Cundell gives 43 species as peculiar to the island. But the mongoose that was imported to keep down the rats has increased to such an extent that it has destroyed much of the bird life, and even the snakes and lizards. The rats, learning wisdom in time, escaped by taking to the trees in which they now dwell. Among the common birds in the gardens round the town are the "Jew birds,"—black birds with curiously thickened beaks, from which they take their peculiar name. Many of the country houses are overrun with a pretty little green lizard, which is very tame, and has a curious habit of puffing out the loose skin under the throat till it stands out like a disc, giving it a very comical appearance. On New Year's Eve I found several in my bed at Hartland's Estate, but they did not seem to mind. There is a great deal of rugged country covered with rich tropical forest, and in the valleys are many fine streams of water, but it was too late in the season for insects.

On our road to Barbados we stopped at several ports on the northern coasts of Venezuela, and some of the natives brought birds for sale, and one had a sloth, one of the most helpless, imbecile-looking animals I ever saw, as it lay on the wharf with its long claws resting on the rail.

At Barbados nearly every bit of the island is under cultivation, so that there is no forest land, and most of the birds are found in the open ground around the swamps. At the Marine Hotel there were large flocks of small blackbirds and sparrows that used to come up and rest on the window sills in a very friendly manner, and even come into the dining-room for bits of bread. Two popular dishes are worth noting: "Sea eggs," the ovae taken out of "sea urchins," which the negroes obtain by diving off the reefs. These eggs are mixed with batter and cooked, and eaten like a pudding. The second are flying-fish, for fried flying-fish is served up every morning at the hotels. They are caught off the reefs by placing a strong light at the stern of the boat, and then when they come round in the water in swarms, slipping a net round and hauling them in. Barbados, though it has much swampy land, is singularly free from mosquitoes, the reason being that the waters swarm with tiny minnows that eat all the mosquito larvae.

In passing through England and Southern Europe there is no need to go into the natural history, as it is so well known, but one of the things that struck me was how abundant moles were all over the south and midlands of England; all the fields were covered with rows of little black mounds of soil thrown up from their underground excavations; and Mr. Theobald, at Wye College, said that in a field of 20 acres, close to the college, the farmer had captured 2000 moles. They did not kill moles at the college on principle, but when they found one trespassing on their well-kept lawn they sank an empty jam jar in his line of march, into which he usually blundered, and was then taken out and liberated in a field where he could do no harm.

In the South of France one sees many blackbirds, thrushes, and now and then a magpie flies across the road, but the latter always struck me that its tail was in its road. In Italy, particularly in the south, one seldom sees any birds in the fields or gardens, because not only do the Italian farmers eat all their own birds, but they put up traps all along the coast and kill thousands of the migratory birds that rest on their coast after crossing over from Africa. In Austria and Hungary, on the other hand, they do everything they can to protect their bird fauna, even to placing hundreds of artificial nests in the trees in the forests and gardens around Budapest.

Crossing the great plains of Servia and Bulgaria, on the road to Constantinople, one first notices the large storks walking about, often close to the houses, and the wild fowl so abundant on the marshes.

At Constantinople the common bird among the houses was the lead-coloured crow with darker wings; it is about the size of our magpie, but had a rugged, unkempt plumage, rather in keeping with the dirty streets of the city.

Fish are plentiful in Constantinople. There is a large one with boney excrescences on the sides, known as turbut in the hotels, and a small silvery blue fish, which they call a herring. The latter are caught in large numbers in the Bosphorous in fine-meshed nets, split open, dried on lines for about three days, and sold in all the shops to the poorer classes. One of the curious dishes I tasted in a Turkish cafe was cuttle-fish, cooked in sauce made from its own ink bag.

The most distinctive tree about Constantinople is the cypress. Numbers of these, with their dark funereal foliage, mark the sites of cemeteries that are scattered all through the town and suburbs. At Scuteri an immense forest of cypress trees covers the great burying-places of the Turks. The most showy in the gardens is the Judas tree, which looks like an overgrown peach, covered with delicate pinkish purple flowers.

Going on to Cyprus, via Smyrna and Beyrout (which latter town is surrounded with mulberry and olive fields), I found every man carrying a gun, and whenever a bird moved it was potted, until I wondered how any bird ever succeeded in getting away into the fields. In the market men were offering for sale strings of birds: rollers, finches, and even swallows. While in Cyprus I went all over the island, and saw much of its natural history, which has been studied by some well-known naturalists. A list of the fauna of the island contains 231 species of birds, many of which are very numerous. The native Cypriots do not seem to harm them. On the road over the barren marl chalk hills, covered only with very low herbage and prickly scrub, we were in the old lands of the plague locust, now a thing of the past. We saw several pairs of the large raven (*Corvus corax*); also a large eagle sailing round over the valley, and numerous small scattered flocks of the common brown crow.

The great central mountain of the island is Mount Troodes, the slopes of which are clothed with several species of stunted oaks, but higher up all is pine forest. Camped at the

summer residence of the Governor, 4000 feet up the mountain side, we saw and heard many birds. Four different kinds of swifts and swallows were nesting under the eaves of the house, and nightingales sang all through the night. We also saw several of the curious-looking hoopoes (*Upupa epops*), with their crown of feathers, said in the old legend to have been given them by Allah to replace the crown of gold they once wore. Finches were plentiful on the low hills, the gold finch, green finch, and linnet being very common. We were on the lookout for the wild sheep (*Ovis ophion*), known as the "Mouffion," which, though now a rare animal, still dwells among the snow on Mount Olympus, but though at one of the villages the head man said they had seen three near the track we came in on, we were not so fortunate. The pretty little crested lark, the green-winged roller, and bee-birds were common on the plains. At the English Club at Nicosia the garden was full of brown crows, which, nesting in the pines, made such a noise that they always woke me up at daylight. Insects were not plentiful on the mountains, but outside the city walls of Nicosia, by turning over stones and clods in the barley fields, I obtained a few Carabs and some curious Heteromera. Around the Athalassa Experiment Farm I took a number of rose chafers and weevils on the thistle heads.

Red scale was very common even on the Acacias in the gardens, and had done a lot of damage to the orange orchards at Famagusta. All round the capital there was hardly anything but Australian trees: eucalypts, acacias, and casuarinas, most of which were planted in the early days of the occupation, when Sir Garnet Wolsley was Governor.

At Cairo, unless one goes out back, he does not find many specimens, for the whole of the delta country is under intense cultivation for cotton. There are, however, several curious gall-making Psyllids on several trees, and on the citrus trees Round Scale (*Aspidiotus fici*) was a very bad pest. The street trees are often damaged by the larvae of a large long corn beetle, *Xystrocera globosa*; while the cotton has a great many enemies, chiefly cut-worms and other moth larvae.

In India I first landed at Bombay, and saw a great deal of the country. In Bombay and all over India one sees flocks of brown crows in the streets and all over the place fighting and scolding over every scrap of food or offal in the streets and squares. I called upon the Secretary of the

Bombay Natural History Museum. The museum is very crowded, and very little attention has been given to entomological collections. There was a very fine Hornbill (*Dichoceros bicornis*) in a cage, which has been in captivity for over 14 years. He looked out of the corner of his eye when he was introduced to me, just as if he understood everything that was said.

In this tropical country, where life is prolific and the religion of the Hindoo does not allow him to take the life of even the smallest creature, you will find birds plentiful, not only in the country districts, but in the streets of the towns. Most of the street trees are members of the great fig family, while in the country, all through the great central plains of Northern India, the Mango grows into a regular forest tree, and is the mainstay of the country. Living in the hollow limbs of the fig-trees are many little squirrels, that apparently range all over India. These are known as the Indian Palm Squirrel (*Sciurus palmarum*). They are very pretty little creatures, of a grey fawn tint, with three distinct stripes, and flattened but bushy tails, and have a habit of running down the tree trunks, stopping head downwards and chattering away at a great rate, their tails moving all the time. They often run across the street in front of the horses, and are very tame, but are not looked upon with favour by the English residents, as they are said to contract bubonic plague, and often die off in great numbers; but the natives often let them nest in the roofs of their huts, and they enter rooms without fear. I wanted to investigate a very sick one on the wall of the Residency at Lucknow, but my guide warned me not to touch it, as it probably had the plague.

In crossing from Bombay to Calcutta, I broke my journey at Allerbhad and Campore; stopped at Pusa, in Upper Bengal, and also went up the foot hills of the Himalayas to Missorie. I only saw a few wild deer on the roadside, but it was curious to see numbers of large monkeys sitting on the roadside around the villages like a lot of children. These monkeys come and help themselves to any food about the stalls, and though the Hindoos drive them away they must not hurt them. We often passed a flock of semi-wild peacocks in the fields, and in the swamps there were plenty of wild fowl.

The commonest animals are the jackals, and about Pusa I saw them come out of the jungle and trot across the road, taking no notice of our cart. Every night we had a regular

concert, not at all like the dingo, but a rising and falling note between a harsh laugh and a sharp call. At Bangalore, west of Madras, the country is very rich, and the public gardens are extensive and well kept. The Jack fruit is very common in the gardens, with its immense fruits growing up the main trunk.

Snakes are plentiful, and whenever we went out at night the servants carried lanterns, and no one would cross over the grass for fear of the Cobra and Russell's Viper, the latter being dreaded quite as much as King Cobra. In Ceylon, Sir William Twynem showed me an iron walking-stick, with two loose iron rings, which he said in old days, when roads were few, every traveller carried at night, rattling the rings to frighten away the snakes in the grass.

About Pusa one always seemed to hear the "fever bird," a cuckoo (*Cuculus micropterus*), that usually perches on the fig-trees in the compound, and calls out at intervals of about a minute with a most monotonous harsh note.

One of the striking things in India is the wonderful number of different kinds of cattle one sees, all shapes and sizes in all kinds of carts and drays. Cattle are universal beasts of burden in India: the mule and the donkey are left behind at Port Said and Cairo, and the camel also, for in any of the parts of India I traversed it was quite exceptional to see one. The elephant is seldom seen on the roads.

In Ceylon I did not have much time to study natural history generally, but everyone knows the little house crows (*Corvus splendens*), with their shining, glossy, black plumage, and familiar bold habits of coming into the houses. They are common around Colombo, and are found all over the island. The manager of the Galle Face Hotel has a notice to visitors in the bedrooms: "Do not leave any small articles of jewellery on your dressing-table, as the crows may carry them off." In the native plantations along the railway line to Kandy, one often sees white and black pots stuck up on posts to frighten these birds away.

At the Royal Botanic Gardens at Peradenya, I saw numbers of the Leaf Phasma (*Phyllum athanysus*) in captivity, feeding upon Mango leaves. At Jaffra, in the north of Ceylon, the country is covered with cocoanut and palmyra palms. The latter is the one they tap and use the juice to drink as "toddy." At a fishing village we stopped at a shed, under which there were a number of turtles turned over on their backs, the most pitiable lot of creatures I saw.

in my travels. How long they had been in this position I could not say, but their eyes were hanging out, and their mouths open almost beyond the power to even gasp. I had seen turtles on the boats from Jamaica, and thought they were not expected to have any feelings, for in order to hoist them on deck, hooks are stuck into their flipper, but they are hosed down every morning. Still, I was more sorry for their brothers in Ceylon.

As you know, there is a very fine museum at Colombo, of which Dr. Wiley is curator. I spent a most interesting morning with the doctor going through the collections.

REPORTS OF EXCURSIONS.

VISIT TO THE ZOOLOGICAL GARDENS.

MAY.—The excursion to the Zoological Gardens on the 8th May proved highly interesting and successful—the latter from a social, as well as from an educational, point of view. The party, consisting of members of the Club, with a “sprinkling” of wives and children, numbered twenty-eight. We are indebted to the President (Professor T. P. Anderson Stuart) and Council of the Royal Zoological Society for their courtesy in admitting the party to the Gardens without charge. I hasten to add that, although two of the party were members of the Royal Zoological Society, this privilege was not sought in any way. We were met at the gates by Mr. A. S. Le Souef, Curator of the Gardens, and were by him conducted to the principal objects of interest. Attention was first bestowed upon the Kangaroos and Wallabies, of which a very instructive and useful collection is displayed. A move was next made to the Birds, the collection of which, though small, embraces a number of very interesting species. The recently-landed Asiatic Tapir next occupied attention. The Royal Zoological Society is to be congratulated upon possessing such a fine representative of this remarkable beast, and no nature-student should miss the opportunity of seeing it. The quaint little Chimpanzee naturally attracted a good deal of attention. The “lion” of the day, however, was the recently fitted up freshwater Aquarium, which, ever since the official opening, has been the great centre of attraction at the “Zoo.” In the Aquarium are a number of interesting fishes and aquatic plants, and these give a very charming effect. The popularity of this recent departure should be a sufficient encouragement and justification to the

Council of the "Zoo." to construct a well-equipped modern aquarium whenever the necessary funds are available. This would do away with the disabilities such as the imperfect conditions and arrangement of the light under which the present Aquarium suffers. Speaking of "lions" reminds me that, although there is not a male representative of the "King of Beasts" on view at present, one will shortly make its appearance from abroad.

After the inspection of the Aquarium tanks, the party adjourned for afternoon tea, and thus ended a pleasant afternoon.—D. G. STEAD.

BOTANY PONDS.

JUNE.—Twelve members and friends attended excursion to Botany Ponds, where a good deal of aquatic microscopic life was obtained, including a number of fishes for aquaria, and some good specimens of aquatic plants. The excursion was under the leadership of Mr. H. E. Finckh, whose practical knowledge of many forms of aquatic life was found most helpful.—H. E. FINCKH.

CONVERSAZIONE.

A CONVERSAZIONE in connection with the Naturalists' Club was held on Wednesday, 23rd June, at the King's Hall, Phillip-street, Sydney, and was a distinct success in every respect. The hall was prettily decorated, and there was a large number of interesting exhibits. In addition to members of the Club there were a large number of guests. The exhibits were arranged and displayed by the organising committee—Messrs. D. G. Stead (president), G. A. Waterhouse, B.Sc., H. E. Finckh (hon. treasurer), and L. Harrison (hon. secretary). A ladies' committee, consisting of Mesdames D. G. Stead, H. E. Finckh, and L. Harrison, supervised the refreshments, and the social success of the function was due in a larger measure to their efforts.

The exhibits were both numerous and interesting. Aquaria were displayed by Messrs. R. J. Geddes and H. E. Finckh. This side of nature study has become very popular of recent years, and judging by the interest displayed in the fascinating exhibits is destined to become even more so in the future. Mr. G. A. Waterhouse's butterflies, as usual, attracted attention. The exquisite specimens, both large and small, and the perfect setting, were greatly admired. In

addition to butterflies, Mr. Waterhouse exhibited a fine collection of larvæ and pupæ. Mr. W. W. Froggatt, F.L.S., showed a handsome collection of native moths and beetles. wood-boring moths, an immense queen white ant, and a set of parasites, which prey upon many of the insects injurious to our units. One of the most interesting of these was the little parasitic wasp discovered by Mr. W. B. Gurney at the Gosford entomological station to be an enemy of the codlin moth. Ladybird beetles, which live upon aphis, a fungus which destroys brown scale, and parasites of the eggs of the plague grasshopper were in the collection. Mr. L. Harrison exhibited a splendid collection of eggs of Australian birds. from the giant cream-coloured egg of the wandering and royal Albatross to tiny eggs of other winged dwellers in the Australian forest. The pale green eggs of the plumed egret and heron, the blotched eggs of the crested tern, Pacific gull and oyster-eater, and the brown-mottled egg of the black-shouldered kite were a few of the gems of this ornithological display. Mr. Harrison and Dr. d'Ombraïn also showed a large number of Australian birds. From the Technological Museum came a collection of foreign and Australian Cicadæ and models of flowers and fishes. Mr. D. G. Stead showed the large eggs of the salmon catfish, and specimens of many of our most interesting fishes, and Mr. W. J. Rainbow, F.L.S., exhibited for the first time a curious aquatic spider alive under water. This spider came from Duck Creek, near Clyde, and had constructed a dome-like nest in the water weeds. Its body was covered with hairs, which enabled it to carry down with it below the surface enough air to enable it to remain submerged for many hours. Mr. W. B. Gurney showed many Mantidæ or 'praying' insects, and stick and leaf insects, and a series of Australian grasshoppers, which included the plague locust. A handsome collection of sea-weeds of this coast was exhibited by Mr. A. H. S. Lucas, M.A., the delicate tracery and rich colouration of these growths having been well-displayed on sheets of paper with infinite pains. Mr. Thos. Steel, F.L.S., showed a collection of native weapons, ornaments, and useful implements. An interesting mass was that of the "vegetable sheep" from New Zealand, one of the lower forms of vegetable life, which bears a curious resemblance to the full-woolled body of a sheep lying asleep. Mr. C. Coles contributed a huge old-man kangaroo, which dominated the assemblage from the rear of the stage.

During the evening Miss Margaret Edson contributed a pianoforte solo, Mr. Cyril Monk played the violin, and Miss

Chalmers showed herself the possessor of a deep contralto voice in a plaintive Scotch ballad. Miss Edson also sang an exceedingly pretty song. Mr. Robert MacMillan in a humorous and instructive speech, commended the exhibitors for their displays, and trusted that the spread of education would be helped thereby.

NOTES AND COMMENTS.

ADDITIONS TO LIBRARY.—The Emu, vol. viii., Part 4, April, 1909; Victorian Naturalist, vol. xxv., No. 12, April, 1909; do., vol. xxvi., No. 1, 1909; Proceedings of the Royal Society of Victoria, vol. xxi., Part 2; Agricultural Gazette, vol. xx., April and May, Parts 4 and 5; Tasmanian Wild Flowers, Tasmanian Field Naturalists' Club; Easter Camp Out, Tasmanian Field Naturalists' Club; Bulletin Museum National d'Histoire Naturelle, Part 6, 1908; Note on an Abnormal Development on Leaves of *Prunus Cerasus*, by Bertha Rees; Contributions to the Flora of Australia (two parts), by Alfred J. Ewart, D.Sc., Ph.D., F.L.S.; Biological Survey of Wilson's Promontory; also, Some Notes on the Flora of Victoria, same author; On *Opuntia Santa-Rita*, a Species of Cactus of Ornamental Value, by J. N. Rose, Associate Curator, Division of Plants, U.S. National Museum; Two New Species of *Abronia*, by Anton Heimerl, University of Vienna; Preliminary Notice of a Collection of Recent Crinoids, from the Philippine Islands, by Austin Hobart Clark, Collaborator, Department of Marine Invertebrates, U.S. National Museum; Toowoomba Canary Grass; also, Nitrogen and Nitragin, both by Alfred J. Ewart, D.Sc., etc.; Technological Museums, Annual Report for 1907; Recording Census of the Victorian Flora, by Alfred J. Ewart, D.Sc., etc., 1908; also by same author, The Changes of Names in the "Recording Census."

WILD LIFE PRESENTATION SOCIETY.—A society which should commend itself to all naturalists has been established, and promises to be highly successful. The name of this organisation is "The Wild Life Preservation Society of Australia." Its object are the preservation of all forms of wild life in Australia, by the development of public interest in its beauties, economic uses, and scientific value, by discouraging the wanton or promiscuous destruction of any form of mammal or bird, by accepting affiliation from any society or corporation in Australasia for the furtherance of the fore-

going objects, and by any other means incidental or conducive to those objects. The officers and council are:—President, Mr. Winchcombe, M.L.C.; vice-presidents, Messrs. H. C. L. Anderson, Dr. Hurst, W. W. Froggatt, and D. G. Stead; treasurer, Mr. S. V. Kearney; hon. secretary, Mr. L. Harrison; council, Dr. Mary Booth, Mrs. Eyres, Mrs. L. Harrison, Mrs. Kearney, Mrs. Ramsay, Miss McClelland, and Mrs. Garvin, Dr. d'Ombraïn, Messrs. H. E. Finckh, F. Farnell, C. Thackeray, A. G. Hamilton, C. Hedley, A. S. Le Souef, W. G. Clark, P. Gilbert, J. R. Garland, V. Le Gay Brereton, Sir Joseph Carruthers, and Count Mörner; hon. auditors, Messrs. W. J. Myles and A. C. P. Sterling.

SNAKES & BULL-DOG ANTS.—A friend recently informed me that he had often found Blind Snakes (*Typhlops*) in the nests of bull-dog ants, near Riverstone, N.S.W. While it is well known that they feed on the eggs and larvae of termites, their occurrence in the nests of such savage insects as bull-dogs is surprising, and any further notes from country members on this subject would be interesting. If possible, the snakes should be forwarded to the Australian Museum for accurate identification, as there are many species in N.S.W.—A. R. MACCULLOCH.

EMUS & THEIR FOOD.—Mr. Hugh Dixon writes us as follows:—Seeing in an old number of THE AUSTRALIAN NATURALIST the mischief Emus may do in spreading prickly pear, I thought the following might interest your readers. Emus will completely destroy blackberries in a very short time. They do this by nipping out the young green shoots almost as soon as they show themselves. No plant can stand this. I believe they would do the same for sweet briar. I had a hedge of blackberries cleared as far as the emu could reach fairly killed, but as it extended to the other side of a fence they did not complete the destruction.

GAGE'S MICROSCOPY.—The Microscope: an Introduction to Microscopic Methods and to Histology, by S. H. Gage, has quite recently reached the 10th edition. The work has practically been re-written, and though retaining the well-known features which have rendered it so popular and valuable, a vast amount of information as to recent advances and improvements in microscopy and technique has been added, more especially in the direction of histology. To enter into detail as to its merits would, now-a-days, be superfluous, but it is permissible to state that this text-book will be found of great service to teacher as well as student.

THE

Australian Naturalist.

VOL. I.

OCTOBER, 1909.

PART 16.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The ordinary monthly meeting was held at 82 Pitt-street, on Thursday evening, July 1, 1909, the President (Mr. David G. Stead) in the chair.

BUSINESS.—Owing to the steamer on which Mr. A. S. le Souëf was returning from the Manning River being delayed, he was unable to deliver his lecture, "Notes on Zoo Work." The President filled in the evening with an impromptu lecture on fish life, illustrated by numerous lantern pictures.

ANNUAL MEETING.—The annual meeting was held on August 5th, 1909, the President (Mr. D. G. Stead) in the chair, when the Annual Report of the Council and the hon. Treasurer's Balance Sheet were read and adopted. The retiring President delivered an address entitled "Fisheries of New South Wales: Present and Potential," which he illustrated with a series of beautiful lantern slides.

ELECTION OF OFFICERS.—The Officers and Council for the ensuing year were elected as per list on cover.

ORDINARY MEETING.—The ordinary monthly meeting was held at 82 Pitt-street, on Thursday evening, September 2, 1907, the President (Mr. W. W. Froggatt, F.L.S.), in the chair.

ELECTIONS.—Messrs. H. K. Anderson and J. H. Parry were elected ordinary members of the Club.

BUSINESS.—The President announced that Mr. Gurney had been called away to Glen Innes on departmental business, and consequently his lecture would have to be postponed. Mr. Froggatt, to make up for Mr. Gurney's absence, gave an account of his recent trip to the Solomon Islands, and showed a beautiful collection of Solomon Island insects, chiefly Coleoptera, which he had made while away.

EXHIBITS.—Mr. C. Coles—web and pupae of a butterfly (*Delias harpalyce*), from South Gippsland. Mr. David G. Stead—a curious species of flounder (*Pelecanichthys crumenalis*), from Hawaii. Mr. H. E. Finckh—living *Tubularia*, from Circular Quay. Mr. Harrison—the undescribed egg of the large-billed black cockatoo (*Calyptorhynchus macrorhynchus*), received through Mr. Edwin Ashby, of Adelaide, from Cape Ford, Northern Territory.

NEW SOUTH WALES NATURALISTS' CLUB.

NINTH ANNUAL REPORT.

THE Council has much pleasure in presenting to the Club the Ninth Annual Report, and in so doing has to record that another successful year has been added to the Club's already honorable and useful career. As the abstract of our proceedings has already appeared in the columns of the "Australian Naturalist," there is no need here to go into any detail regarding them.

During the year, in addition to the Annual Meeting, ten ordinary meetings and one special meeting have been held. The special meeting mentioned was in March, when certain alterations and amendments were made to the Club's rules. The new rules have since been printed, and circulated among the members. In the new rules the regulations governing the issue of books from the Club's Library have been included as sub-sections of Rule 15. These regulations, though in force for some time previously, were practically unknown to the members, who, no doubt, will now fully avail themselves of the privileges afforded. According to these new rules also, the office of honorary librarian is done away with, and the honorary secretaries jointly carry out the duties of that position.

During the year a number of highly entertaining and useful addresses have been given by various members, and many interesting as well as unique exhibits have been shown at the meetings. Reference to the meetings and excursions will be found in the Club's Journal, which has been issued as usual.

The Library has benefited greatly by numerous additions from learned societies, museums and private individuals.

By far the most successful function of the year was the Club's conversazione, held at the King's Hall, on the 23rd June, 1909. This was held under most auspicious circumstances, was attended by members and guests to the number of about 200, and was altogether a brilliant success.

The membership of the Club now stands at 125. New members to the number of 19 were elected during the year and 12 resigned. At the June meeting, was elected the first honorary member of the Club, Professor David Starr Jordan, the well-known American Educationist and Ichthyologist.

As will be seen by the Honorary Treasurer's statement, the finances of the Club are in a sound condition, and we enter upon the new year with a balance of £61 3s. 1d.

DAVID G. STEAD, President.

L. HARRISON, Hon. Secretary.

THE FISHERIES OF NEW SOUTH WALES: PRESENT AND POTENTIAL.

(Abstract of Presidential Address by David G. Stead.)

THE present fisheries of New South Wales embrace within their scope: (1) Fishes, (2) Crustaceans, (3) Mollusks, and (4) Cetaceans (Whales and Dolphins); and to these should be added in the near future Sponges and "Seaweeds" (Marine Algae).

New South Wales has a known fish fauna of not less than about 550 species. Of these at least 250 are of a good edible character. As times goes on it may reasonably be expected that the already long list will receive many additions.

During the last few years an average annual amount of not less than 10,000,000 to 12,000,000 pounds weight of fresh fish has passed through the fish markets; while, in addition, a very large amount was disposed of without passing through any recognised market, and consequently without being recorded.

As our ocean fisheries are hardly touched as yet, it is not likely that the species of fishes at present of greatest importance will still occupy that relative position in our future fisheries. But even without touching our ocean resources, our estuaries and harbours are not yielding more than a fraction of what they are capable of.

New South Wales is well supplied with edible Crustaceans, in the shape of marine Crayfishes or "Spring Lobsters" (*Palinurus*), the Freshwater Crayfish (*Astacopsis*), not less than half-a-dozen species of Prawn of the genus *Penaeus*, a number of edible Crabs of several genera, as well as others. In the year 1907 nearly 85,000 Crayfishes and 187,000 quarts of Prawns passed through the recognised markets alone of New South Wales.

The principal commercial Mollusk of New South Wales is, of course, the common oyster (*Ostrea cucullata*), which is extensively farmed in many of the estuaries along our coast. At the present time over 17 millions of oysters are taken annually off the oyster-beds of this State. The possibilities of this industry in New South Wales are enormous. Other Mollusca also are of economic importance in New South Wales.

Quite a number of species of Cetaceans roam our seas, and of these, the most important are the whales. Whaling is carried out regularly at Eden, Twofold Bay (on our South Coast), and here an important industry has been built up. A small Dolphin fishery is also pursued here at present, and this could be increased with great advantage. The objec-

tive is the Dolphin's teeth, which are sold to island traders, who dispose of them to the natives of certain Pacific Islands, as well as Papua.

Though a number of useful Sponges are to be obtained in abundance in our waters, nothing in a commercial way has, so far, been done with them.

There appear to be also great prospects for the development of an industry for the utilisation, in a commercial way, of our marine Algae, for the purpose of preparing vegetable isinglass, seaweed glue, etc., etc. Nothing has been attempted in this State so far, in connection herewith.

[The full text, with additions and illustrations, of Mr. Stead's address is being published by the Department of Fisheries, under the title of "A Brief Review of the Fisheries of New South Wales: Present and Potential."—ED.]

REPORTS OF EXCURSIONS.

TRIP TO LINDFIELD.

JULY.—The excursion to Lindfield on the 3rd July was somewhat marred by wet weather. A number of members braved the elements, however, and followed the leader, Mr. L. Harrison, down into the gullies on the Middle Harbour side. A number of interesting botanical specimens were obtained, and several species of galls were collected, which were identified by Mr. W. B. Gurney. Unfortunately, the prevailing cold had delayed the nest-building, and the only ornithological item of interest was a last year's nest of the Grey Thrush, beautifully situated in a depression in the charred bole of a large hollow gum.—L. HARRISON.

VISIT TO THE MACLEAY MUSEUM.

AUGUST.—About twenty members and friends took part in this excursion. Meeting in front of the Great Hall of the University at 2.30 p.m. (on the 7th August) the party adjourned to the Museum, where, before making any inspection, I gave those present a short address upon the history of the collections, and also of the Museum itself, since its foundation at the University. This address was listened to with much apparent interest by those present, and I now take the opportunity of officially thanking them for their attention, both there and during the tour of inspection, which lasted about an hour and a half. As these collections were new, or very little known to most, attention was bestowed only on those exhibited in the glass cases, and these—as was thought—proved, by their wide range, as well as by their quantity, to be more than enough. As my particular "forte" lies more with the Fishes and Crustaceans, and some other

marine Invertebrates, more attention was bestowed upon those groups, though the Mammals, Birds, Mollusks, and the Ethnological exhibits also attracted considerable attention. Much general interest was evinced, and everyone present seemed to be pleased with the afternoon's outing—which was decidedly of an educational character. Our thanks are due to Mr. George Masters, the Curator, and to the University authorities for their courtesy in making the Museum available on a Saturday afternoon.—DAVID G. STEAD.

VISIT TO THE AUSTRALIAN MUSEUM.

SEPTEMBER.—On Saturday, September 4, a large number of members visited the Australian Museum, over which they were conducted by Mr. W. J. Rainbow, F.L.S. The party first inspected the fossils in the Palaeontological gallery, then the fine collection of Australian Mammals, and afterwards the Cook relics that are now displayed in a large recess in one of the new galleries; next they turned their attention to the fine collection of birds, evincing much interest in Antarctic forms collected by the Shackleton expedition. The Penguins were particularly admired. After inspecting the birds Mr. Rainbow conducted the members to the Invertebrate gallery, where considerable time was spent in inspecting the Entomological treasures there displayed. The butterflies, both native and exotic, were greatly admired, the leader adding additional interest by a brief explanation of protective and mimetic colouration and formation. The splendid working models of the honey-bee, beetle, and spider were also briefly explained. Altogether about two hours were spent, and the visit proved both interesting and instructive. In a few months' time, when the new galleries are open, the grand Ethnological collection, which has been so long closed to the public, will be displayed, and this will, in itself, form the motif for another visit.—ED.

THE CLUB.

SINCE the annual meeting of the Club, our hon. secretary and hon. treasurer have issued a circular to members. As the matter dealt with in the note is of importance to all, it will, perhaps, serve a useful purpose if a permanent record be made of it. With this object in view, after making necessary alterations from the original text, the two following clauses are herewith published, and to these the Officers and Council would particularly solicit not only the *attention* of members, but also *their hearty co-operation* :—

“Our Club has just concluded a most successful year, scientifically, socially, as well as financially, records of which

will be found on another page in the present issue of this Journal.

"Each member is particularly requested to assist in our useful and delightful work, and to help to make this, the tenth year upon which we are just entering, even more successful than the previous ones; to bring interesting exhibits of any kind to our meetings; to share his or her ideas, knowledge and experiences with his or her fellow members, and to as far as possible take an interest in the excursions by personal attendance."

CURRENT LITERATURE.

PART 4 of "Records of the Australian Museum," just published, is in point of size a record number, whilst in respect of matter it maintains the high standard it has previously attained. Dr. Walter E. Roth, late Chief Protector of Aborigines, Queensland, continues his researches in "North Queensland Ethnography," the subject dealt with in this issue being "Fighting Weapons." This paper is illustrated by one text figure and four plates. From an Ethnological standpoint this paper (Bulletin No. 13) is exceedingly interesting. The weapons dealt with include spears, wommeras, boomerangs, shields, nulla nullas, fighting-poles, and swords. The manner of inter-tribal and individual fighting is also described. Mr. W. J. Rainbow, F.L.S., contributes an interesting paper on "The Architecture and Nesting Habits of Australian Araneidae," illustrating it with three text figures and three beautiful plates. "Lower Cretaceous Fossils from the Sources of the Barcoo, Ward and Nive Rivers, South Central Queensland, Part 2—Cephalopoda," is the title of a paper by Mr. R. Etheridge, jun., Curator, and this is illustrated by four plates. Mr. T. Harvey Johnston, M.A., B.Sc., Parasitologist, Bureau of Microbiology, contributes five papers—"On a New Species of Aphrodita," "On a Cestode from *Dacelo gigas*, Bodd," "An Australian Chaetognath," "On a New Haemoprotozoan," and "Notes on Australian Entozoa, No. 1." Of these papers the four first-named are illustrated; the fifth is an exhaustive biological and bibliographical catalogue, and is, in fact, a meritorious contribution to the literature of the subject upon which it deals. Mr. C. Hedley and Mr. A. F. Bassett Hull have collaborated on a paper entitled "Descriptions of New and other Australian Polyplacophora," whilst Messrs. Hedley and W. F. Petterd have joined hands in another Conchological paper, "A Revised Census of the Terrestrial Mollusca of Tasmania," and both of these contributions are also copiously illustrated. "The Results of Deep-sea Investigation in the Tasman Sea—The Polyzoa" (four plates) comes from the pen of Mr. C.

M. Mapleson. Contributions by Mr. Allan McCulloch comprise "Studies in Australian Crustacea, No. 2," and "Studies in Australian Fishes, No. 2" (two plates and text figures). A paper, "Description of the Female, with Nest and Eggs, of the Cinnamon-chested Ground Thrush" (plate), appears under the name of Mr. A. J. North. Lastly, Mr. W. W. Thorpe contributes a short but interesting paper on "Aboriginal Drawings in Rock-Shelters at Bundanoon" (two plates). Part 1 of "Proceedings of the Linnean Society of N.S.W. for 1909" contains, in addition to the Presidential address by Mr. A. H. S. Lucas, M.A., B.Sc., "Notes on the Geology of the Mt. Flinders and Fassifern Districts, Queensland," by Dr. H. I. Jenson (pls. i.-vi.); "Notes on Australian Coleoptera, with Descriptions of New Species of *Tenebrionidae*," by Mr. H. J. Carter, B.A., F.E.S. (text figs.); and "The Geology of the Canoblas Mountains," by Mr. C. A. Sussmilch, F.G.S., and Dr. H. I. Jenson (pls. vii.-ix.) In Part 2 of the same publication, Mr. R. J. Tillyard, M.A., F.E.S., continues his "Studies of our Native Dragon-flies," there being three papers by him: (1) "On Some Rare Australian Gomphinae, with Description of New Species" (pls. xxii.-xxiii.); "Studies in the Life-histories of Australian *Odonata*—I. The Life-history of *Petalura gigantea*, Leach" (pl. xxiv.); and II. "The Life-history of *Diphlebia lestoides*, Sely" (pl. xxxiii.). Mr. Thos. G. Sloane publishes the "Second Supplement to the Cicindelidae of Australia"; and Dr. A. J. Turner, F.E.S., a paper on "New Australian Lepidoptera belonging to the Family *Noctuidae*." Amongst papers interesting to botanists, there are "Notes on Native Flora of New South Wales, Part vii., Eastern Monaro," by Mr. R. H. Cambage, F.L.S., and "Notes from the Botanic Gardens, No. 14," by Messrs. J. H. Maiden and E. Betcher.

"TAGGING" OR MARKING OF BIRDS.

IN the April number of "The Auk," Mr. L. J. Cole contributes a paper on the importance of "tagging," or marking, birds as a means of studying their movements. The author points out we are still nearly as much in the dark as regards migration as was the case a century ago. Most of the knowledge gleaned up to the present on this question has been gained by studying mass movements, so that we are ignorant of the wanderings of individual birds. "It is truly wonderful," says Mr. Cole, "that birds can wing their way from the region where they breed to a far distant land, and wonderful that birds can wing their way back again to the same region. But how much more won-

derful if they come back to the very locality which they left the year before. And how little exact knowledge we have of their ability to do this!" In order to gain more exact knowledge of bird movements "tagging," or marking individual birds is suggested, as this would aid not only the study of the general migration of species, but assist in analysing the factors connected with migration as a whole.

It is interesting to note in respect of this question that active measures are being taken to inaugurate a system of bird-marking in the United States. Individual efforts in this direction are not unknown to ornithologists. Audubon, in "Birds of America," relates experiments made by him with Pewee fly-catchers. A light silver band was attached to the legs of several individuals, loose enough not to hurt, but so fashioned that no exertion of theirs could remove it. The birds migrated at the proper season, but on their return, the author again visited their haunts, and examined a number of individuals, and was ultimately rewarded by finding that two of them had the little ring on the leg. In England, Mr. H. F. Witherby, editor of "British Birds," is making similar experiments. The rings used for marking are extremely light, and do not in any way interfere with the birds' flight; each is stamped "Witherby, High Holborn, London," and bears a distinctive number, which in the smaller sizes is stamped inside the ring, in the hope that anyone into whose hands should fall a bird so marked, would send the bird and the ring, or, if that be not possible, then the particulars of the number on the ring, the species of bird, with the locality and date of capture, to the address given. In addition to London, it has been announced that Aberdeen has also been made a bird-marking centre. Perhaps some of our Australian ornithologists may be induced to establish "tagging" or marking centres in the Commonwealth. Birds which nest in large colonies, such as the gulls, terns, herons, etc., offer special advantages for banding and making subsequent observations, and excellent work can be done by anyone who would care to take the trouble of visiting the birds at their breeding places. Small birds could be trapped, marked and released. This continued systematically through successive seasons and migration periods, could hardly fail to yield valuable results. If a bird previously banded were trapped, the record could be made, and the creature released.

NOTES AND COMMENTS.

BALANCE SHEET. — The balance sheet which was submitted to the Club at its annual meeting, and adopted, was as follows:—Receipts—To balance from last

year, £59 15s. 3d.; subscriptions for current year, £38 7s. 6d.; paid in advance, £1 10s.; arrears, £9 15s.; sales of publications, £1 9s. 1d.; interest in Savings Bank, £1 15s. 7d.; advertisements in Journal, £4; total, £116 12s. 5d. Disbursements—Rent, £6 17s. 6d.; printing of journal and notices, £24 6s.; arc lamp, £1 12s. 6d.; dredge outing, £1; badges, £1 2s. 11d.; printing of rules, £2 8s. 6d.; postages, £5 10s. 6d.; stationery, 15s.; printing, £2 4s. 6d.; conversazione, £9 11s. 11d.; balance in Savings Bank, £59 16s. 8d.; in hands of hon. secretary, £1 6s. 5d.; total, £116 12s. 5d.

ADDITIONS TO THE LIBRARY.—“Victorian Naturalist,” vol. xxvi., parts 2, 3 and 4; “Papers and Proceedings of the Royal Society of Tasmania, 1908”; “Geelong Naturalist,” vol. iv., No. 1; “Australian Photographic Journal,” August, 1909; “Records of the Australian Museum,” vol. vii., No. 4; “Proceedings of the Royal Society of New South Wales”; from the Smithsonian Institute: “Descriptions of Some New Species of Mosquitoes,” “Zoological Gardens of Great Britain, Belgium, etc.,” “Systematic Zoology: Its Progress and Purpose,” “Linnean Memorial Address,” “Geneological History of Marine Animals”; “The Archer Fish and Its Feats”; “Smithsonian Notes, vol. 52; part 2; “Observation of Living White Whales.”

MYRIAPODA.—The hon. Editor is anxious to obtain specimens, with localities and dates, of our indigenous Centipedes and Millipedes. Specimens preserved in spirit, and addressed to him, at the Australian Museum, will be thankfully received.

FRUIT-FLY.—The “Official Report on Fruit Fly and Other Pests in Various Countries,” by W. W. Froggatt, F.L.S., which has just been published by the Minister for Agriculture, is not only of the deepest interest to that section of the community most intimately interested in the study of insect pests, but is in every way creditable to the author. It is not given to every public officer to have the opportunity of travelling round the world and studying important questions under varying conditions, but when the opportunity does present itself, and is handled in the intelligent manner it has been by Mr. Froggatt, much benefit must be the inevitable result. Much of the ground covered by Mr. Froggatt in his report has been already made public in his “Progress Reports” to the Ministers of the different States, whilst he was on his tour; it is now amplified and extended, and embraces a great deal of information of supreme economic importance to the cultivator individually, and therefore to the community at large. The report contains 115 pages of letter-press,

eight plates (beautifully drawn) of various species of fruit fly, in addition to a large number of others of general interest, spread throughout the volume. The report is divided into three parts. Part I.—General Report deals with: (1) The Commercial Value of Introduced Parasites to deal with Insects that are Pests; (2) The Range and Spread of Fruit-Flies and the Methods Adopted in Other Countries to Check Them; (3) The Value of Parasites in Exterminating Fruit-Flies; (4) Habits of Cosmopolitan Insect Pests. Part II.—Notes on Parasites or Insects that have been introduced from Foreign Countries to Check or Exterminate Injurious Insects. This part deals with parasites, and their value and limitations in controlling injurious insects of the garden and orchard. Part II.—Fruit Flies. In this part we have a general account of the flies belonging to the family Trypetidae, that damage sound fruit, with descriptions of the different species (of which some are new to science, and are now described for the first time), and their habits, range and suggestions for destroying them. There is also a list of Walker's species (with references and localities) of the genus *Dacus*, together with a list of other species of the same genus by other authors from a wide range of localities, and which were not represented in any of the collections inspected during the author's tour.

CLAY CELL BUILT BY A CICADA.—An interesting specimen has been received by the secretary of the Society from Mr. Hugh Dixon, of Abergeldie, Summer Hill, consisting of a curious clay cell, containing a dead pupal cicada with a horn on its head. The clay cell is very interesting, and is formed by the pupal cicada before coming out as a perfect insect above the hole in the ground. Though these clay caps are rare in Australia, in some parts of the forest lands of the United States the Seventeen-Year Cicadas sometimes cover the ground with thousands of little turrets, or caps, above the tunnels by which they have come up to the surface. These have been described as "Cicada Cities." It has been suggested that for some unknown reason the cicadas are not ready to cast their larval skins when they reach the surface, so they construct these covering clay caps to shelter them from their enemies until they crawl out to emerge as perfect insects. The cicada sent by Mr. Dixon was attacked by the fungus known as Cordiceps, common on the root-eating larvae of wood moths, and which turn them into what are popularly known as "vegetable caterpillars," but in Gray's paper on "Fungoid Parasites" (1858), there is a drawing of an infested cicada among a number of other insects.—W. W. FROGGATT.

THE
NEW SOUTH WALES
NATURALISTS' CLUB.

RULES OF THE CLUB.

(AS REVISED, 1909.)

(JULY, 1909.)

RULES

OF THE

N.S.W. Naturalists' Club.

1. The Club shall be called "THE NEW SOUTH WALES NATURALISTS' CLUB."

2. The objects of the Club shall be—The encouragement of the study of nature, and of the collection, preservation and systematic classification of specimens, to be promoted by periodical Meetings and Excursions; the formation of a Library, and the publication of papers and proceedings, when deemed advisable.

3. The Club shall consist of (a) Ordinary, (b) Life, (c) Junior and (d) Honorary Members.

(a) Ordinary Members shall pay an Annual Subscription of Ten Shillings, or, if resident outside the Metropolitan penny postal area (or otherwise as may be decided by the Council), an Annual Subscription of Five Shillings; provided that Members elected after January in each year, may pay half the Annual Subscription for the remainder of that year.

(b) An Ordinary Member may become a Life Member by paying all arrears (if any) together with ten (10) Annual Subscriptions in one amount.

(c) Junior Members shall be under the age of eighteen years. They shall not be entitled to vote, and shall pay an Annual Subscription of Five Shillings, or, if elected after January, a Subscription of Half a Crown for the remainder of the year. If there be more than one Junior Member in a family, then each additional Junior Member shall pay an Annual Subscription of Half-a-Crown.

(d) Honorary Members, who shall be entitled to all the privileges of Ordinary Members, shall be persons not resident in New South Wales, who are distinguished for their attainments in Natural Science or who have performed conspicuous services for the Club. The nomination of any person as an Honorary Member must be approved of by the Council and the election be conducted in the same manner as that of Ordinary Members.

4. All Subscriptions shall become due on the first day of August and shall be payable in advance.

5. Candidates for admission as Members of the Club may be nominated by two Ordinary Members at any Meeting of the Club, the election taking place at the ensuing Meeting. If a ballot be demanded, one black ball in six shall exclude. No person who has been elected shall be entitled to the privileges of a Member until the Subscription shall have been paid, or while the Subscription is in arrears.

6. Members may withdraw from the Club on paying all arrears, returning all books or other property which may have been borrowed from the Club, and giving due notice to the Secretary in writing of the desire to resign.

7. The Council may remove from the Roll the name of any Member whose Subscription is six months in arrears.

8. The Council shall consist of a President, two Vice-Presidents, Honorary Treasurer, Honorary Secretary, Honorary Assistant Secretary, Honorary Editor, and six other Members as hereinafter provided. At all meetings of the Council five shall form a quorum.

9. The Council shall retire annually but shall be eligible for re-election at the Annual Meeting. At this Meeting the new Council shall be elected by ballot after nomination.

10. Any extraordinary vacancy in the Council may be filled by the Council at their next Meeting. Should any Member of the Council fail to attend three consecutive Meetings, without communicating with the Hon. Secretary, his seat shall be declared vacant.

11. The Council shall have the general management of the Club's affairs, and shall regulate and decide all matters not specially provided for in these Rules. Matters requiring immediate attention, may be decided by the President, the Honorary Treasurer, and the Honorary Secretary.

12. Ordinary Meetings for General Business, the Reading of Papers and Exhibition of Specimens, shall be held on the first Thursday in each month, unless otherwise determined by the Council.

13. The Annual Meeting of the Club shall be held in August in each year. At this meeting the Council shall submit a Report of the Proceedings of the Past Year, and the Honorary Treasurer a Financial Statement, duly certified to by two Honorary Auditors appointed at the previous Ordinary Meeting.

14. A Special Meeting of the Club may be called by the Council for any purpose, on the written requisition of not less than seven Members.

15. Books (including papers) in the Club Library may be borrowed by Ordinary Members, subject to the following regulations, but they shall not be issued to Junior Members.

- (a) Members shall be responsible for such books as they may borrow, and shall be called upon to replace any that may be lost or damaged whilst in issue to them.
- (b) Books shall be issued for a period not exceeding one month, but may be re-issued, if not enquired for during that time.
- (c) Books shall not be re-issued if not brought in for inspection at the expiration of the term for which they have been issued.
- (d) The Librarians (who shall be the Honorary Secretaries) shall not issue books to a Member who, having lost a book, has not replaced the same.
- (e) The Librarians shall keep a register wherein they may enter the names of books borrowed, and members borrowing the same.
- (f) The Librarians shall issue books at such times and places as the Council may appoint.
- (g) The Council shall be empowered to withdraw certain books from circulation.

16. It shall be the duty of the Honorary Treasurer to receive all sums of Money due to the Club, to pay only such accounts as may be ordered by the Council; to keep an account of such receipts and payments, and to produce same when requested by the Council.

17. It shall be the duty of the Honorary Secretaries to conduct the correspondence of the Club, attend all Meetings, take Minutes of the proceedings, keep a Register of the names and addresses of all the Members, issue the necessary Notices of the Meetings of the Club, and otherwise perform the usual secretarial duties. They shall also have the custody of any books or other property of the Club, and they shall have power to lend books to Members, subject to the regulations under Rule 15.

18. An Editorial Committee, consisting of the President, the Honorary Editor, and one other Member of the Council, shall be appointed annually by the Council. All matter intended for publication in the "Australian Naturalist" shall be referred to this Committee.

19. The legal ownership of the property of the Club shall be vested in the President and Vice-Presidents for the time being, in trust for the use of the Club, but the Council shall have full control over the expenditure of the funds and management of the property of the Club.

20. Branches of this Club, consisting of a minimum of six Ordinary Members may be formed in any district outside the Metropolitan penny postal area, or otherwise as may be decided by the Council, and subject to the following conditions:—

- (a) The Branch shall pay annually the sum of two shillings *per capita*; this sum to be due on the first day of August in each year.
- (b) Each Member of the Branch shall be entitled to receive a copy of each number of the "Australian Naturalist" as it is published, and such copies shall be supplied to the Branch Secretary in bulk for distribution among his Members.
- (c) Should the issue of the "Australian Naturalist" be increased from a quarterly publication, the Council of the Central Club reserves the right to increase the Annual Subscription of Branch Clubs to a sum not exceeding Three Shillings and Sixpence *per capita*.
- (d) Branch Members may attend any Meeting or Excursions held by the Central Club, but they shall not be entitled to vote.
- (e) They may borrow Books from the Club Library, subject to the regulations under Rule 15, and providing carriage both ways is paid by the borrower.
- (f) They may communicate notes to, or exchange specimens with, individual Members of the Central Club, or they may forward specimens for classification, or for other information thereon, to the Central Club. The latter undertakes to supply all available information, as soon as practicable. Carriage from and to the sender to be paid by the latter.
- (g) A short account of the Meetings and Excursions of each Branch will be published (provided the information is forwarded in time by the Branch Secretary) in the "Australian Naturalist."

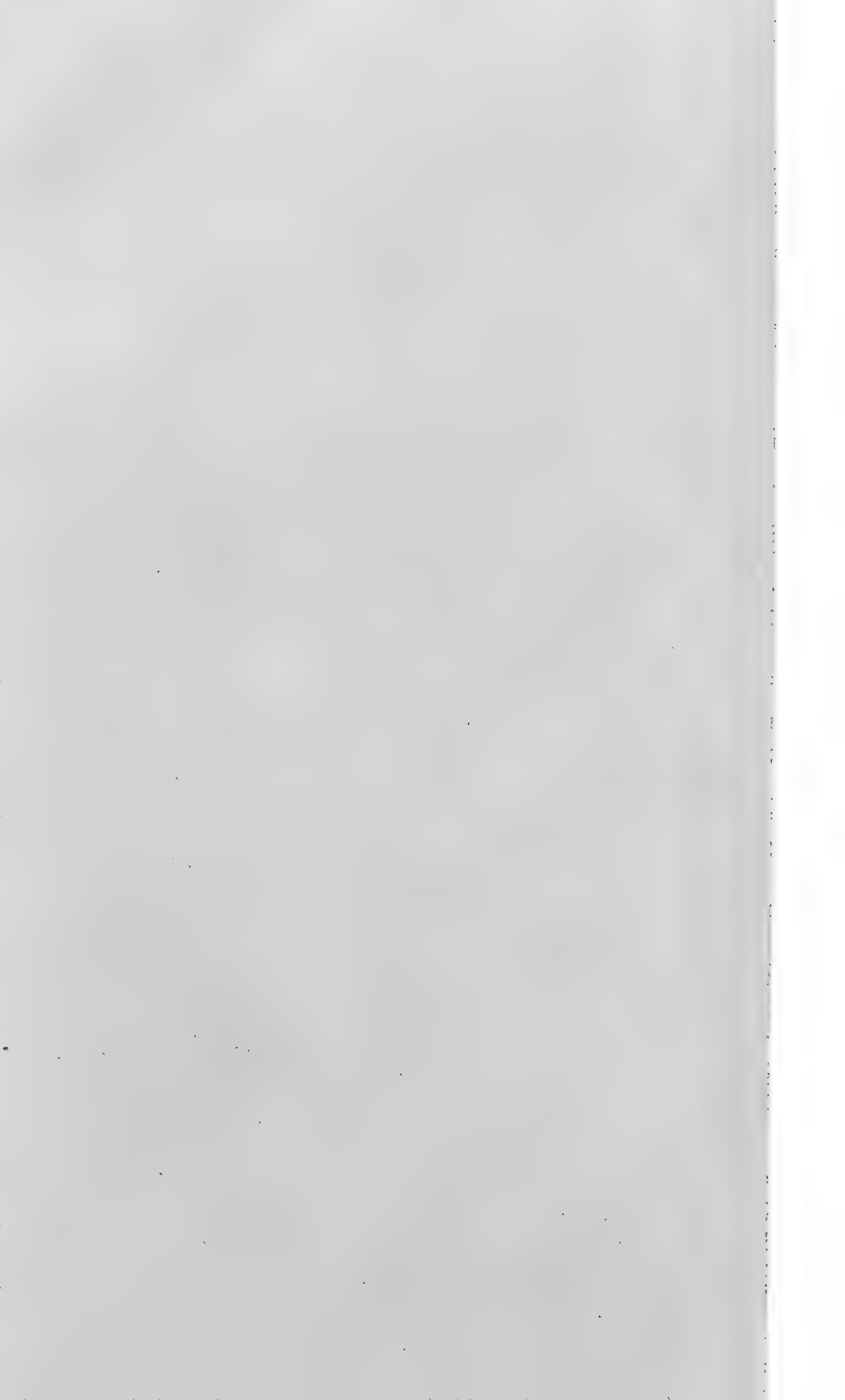
21. These Rules can only be altered by a majority of two-thirds of the Members present, at an Annual Meeting, or at a Special Meeting convened for that purpose by the Council; due notice of which must be given at the previous Ordinary Meeting.

INDEX.

	PAGE
Algæ ...	31
Aquarium ...	33
Animal Life ...	121
Ants ...	42, 46, 88, 169, 184
Apes ...	122
Aphis ...	169
Araneidæ ...	34, 41, 60, 76
Bee ...	7, 86, 189
Beetles ...	17, 23, 30, 33, 58, 63, 68, 189
Bladderwort ...	31
Birds ...	9, 48, 70, 74, 110, 131, 155, 191
Botanical ...	102
Bugong Moth ...	47, 64
Butterflies ...	24, 26, 64, 75, 87, 91, 93, 107, 109, 122, 148, 158, 185
" and Birds ...	25, 47, 64, 74, 135, 158
Cassowary ...	52, 54
Centipedes ...	193
Cetaceans ...	187
Chalcidæ ...	82
Chelifers ...	135
Chitons ...	113, 136
Cicada ...	195
Cockatoo, Black ...	185
Cockroach, Aquatic ...	87
Cowpea ...	33
Crustacea ...	67, 152, 187
Culicidæ ...	124
Dragon-flies ...	83, 121, 136, 191
Diptera ...	7
Dolophones pilosa ...	34
Drocera ...	32
Emu ...	50, 160, 184
Fairmaire, Leon ...	134
Fauna, Destruction of ...	44, 112, 183
" Native ...	124
Ferns ...	67
Fig Trees ...	69
Fiji ...	66, 70
Fishes ...	69, 107, 152, 185
Fleas ...	75, 170
Flies ...	157
Frogs ...	129, 172
Fruit-fly ...	195
Fossil Mammals ...	160
Foxes ...	8
Fungus, a new ...	136
Galls, Insect ...	79
Geological Time ...	14
Geology ...	26
Great Barrier Reef ...	15

	PAGE.
Grey Thrush ...	188
Inscriptions, Babylonian ...	24
Insects, Aquatic ...	44
Jacoby, Martin ...	120
Kermadec Islands ...	153
Kosciusko... ...	17
Lady-birds ...	33
Lamarck, J. B. de ...	76
Lichens, Australian ...	102
Liberkuhn, A New ...	108
Linné, Carl von ...	76
Lizards ...	138
Lyre Bird ...	8
Locusts ...	159
Malarial Fever ...	120
Man, Primitive ...	127
Mankind, Lower Races of ...	122
Mantis ...	105
Marine Animals, Preservation of ...	116
Millipede ...	67
Mite, Terrestrial ...	75
Mollusc, An Interesting ...	121
Mosquito Preventive ...	160
Mosquitoes ...	63, 75, 120, 136
Mother-o'-Pearl ...	11
Museum, Australian ...	123, 159, 189
" Macleay ...	189
" Tasmanian ...	101
Mussels ...	67
Natural Selection ...	39
Oological Collection ...	118
Oyster ...	149, 187
Ostriches ...	50, 52
Owls, Luminous ...	121
Palms, Cocoa-nut ...	67
Parasites ...	64, 88, 132
Papilio ægeus ...	91
Pea-nut ...	109
Penguins ...	189
Pond-Life ...	31
Prickly Pear ...	160
Pseudophryne, Notes on ...	145
Polyplacophora ...	113
Rheas ...	50
Rubber Tree ...	109
Scorpions ...	68
Shark, Fresh-water ...	67
Shoalhaven, Geology of ...	26
Snail, Garden ...	86
Snakes ...	14, 184
Spiders ...	34, 39, 41, 60, 68, 70
Stalactites, Growth of ...	85
Ticks ...	7
Time, Geological ...	14
Torres Strait ...	126
Tree Fern, Sub-Antartic ...	111
Wattles ...	28, 33
Weed Weevil ...	172





THE

Australian Naturalist

JOURNAL AND MAGAZINE

OF

The Naturalist's Society of New South Wales.

Edited by W. J. RAINBOW, F.L.S., F.E.S.,

and

THOS. STEEL, F.L.S.

VOL. II.

SYDNEY, N.S. WALES :

S. D. TOWNSEND AND CO., PRINTERS.

1910 - 13.

THE AUSTRALIAN NATURALIST.

Vol. II.

1910-13.

ORIGINAL PAPERS.

	Page-
Betche, E.—Key to the Goodeniaceae	157
Breakwell, E.—Botanical Notes	182
Brentnall, R. W.—The House Fly	81
Brewster, Mabel.—Artificial Rearing of <i>Polistes Tasmaniensis</i>	140
" " Observations on Ants	178
" " Silver-stripe Hawk-moth	191
Cambage, R. H.—Botany in Relation to Geology	15
Campbell, M.—Moth Pupation	191
Carne, W. M.—Botany through the Camera	130
" " Plant Association	192
" " Extra-floral Secretion of Nectar in <i>Acacia</i>	198
Cheel, E.—Notes on Wattles	62
" " Notes on Fungi	74
" " Symbionts	138
" " Effects of Artificial Light on Trees	117
" " Botany in Relation to Agriculture	152
" " Variations in Plant Life	207
" " Jews-ear Fungus (<i>Hirneola polytricha</i>)	225
Fanning, Bertha.— <i>Chelepteryx Collesi</i>	221
Forel, A.—Notes on Ants	50
Froggatt, Gladys H.—Salt Water Mosquito	132
" " Flies Attacking Grapes	139
" " Indian Wax-scale (<i>Ceroplastes ceriferus</i>)	156
Froggatt, W. W.—Kirby's Catalogue of Orthoptera	32
" " Insects and Disease	39
" " Alteration of Bird Names	102
Gurney, W. B.—Insects and Wattles	56
" " Aquatic Insects	104
Hamilton, A. A.—Rare Acacias at Leura	180
" " Some Interesting Goodeniaceae	211
" " Botanical Notes	222, 224
" " Nepean River Plants	213
Harrison, L.—Bird Notes	4, 16
Hedley, C.—Evolution of Queensland Coast	19
" " The Mangrove Swamp	21
Lovell, H. Tasman.—Variation in <i>Lambertia formosa</i>	141
Soüef, A. S. le.—Notes on Zoo Work	2
" " Modern Zoos	93
Stead, D. G.—Vernacular names of Fishes	103
" " Bird Notes	169, 199, 215
Steel, T.—Natural History Miscellany	64
" " Miscellanea Entomologica	174
Sulman, F.—Flora of New Zealand	220
Thackery, C.—The Angler as a Naturalist	80
Tillyard, R. J.—Dragonflies	26
Waterhouse, G. A.—Butterflies of North Queensland	52, 126
" " <i>Miletus hecalius</i>	78
" " Myrmecophilous Lycaenid Larvae	177
Watts, Rev. W. W.—Mosses	86

INDEX.

Page

Acacia	56, 62, 180, 198
Agriculture and Botany	152
Ants	50, 176, 178
Asilis	136
Aquarium Society	189
Aquatic Insects	104
Araneidae	23, 118
Australian Natural History	64
Balloon Vine	137
Bees and Robber Fly	136
Betche, Mr. E.	227
Bidens	184
Birds and Butterflies	111, 119, 120, 133
Bird Names	102
" Notes	4, 16, 110, 119, 121, 123, 124, 169, 199, 203, 215
Botany and Agriculture	152
" " Geology	15
" through Camera	130
Botanical Notes	182, 185, 187, 207, 211, 213, 220, 222, 224
Butterflies	36, 52, 78, 83, 111, 119, 126, 134, 184, 216
" of Queensland	52, 126
Callistemon	185
Calyptorhynchus	6
Campanotus	176
Cardiospermum	137, 168
Chaerocampa	191
Chelepteryx	221
Coast evolution	19
Cockatoo, Black	6
Coleoptera	13
Conchology	19, 30, 84
Ceroplastes	156
Dacela	215
Diplodactylus	168
Dipterous larvae	187
Dragonflies	26, 35, 111, 133
Egg, Fossil	83
Entomology	39, 56, 104, 120, 135, 139, 174, 203
Erodium	184
Fins, function of	166
Fish	47, 80, 166, 227
Fishes, Vernacular names	103
Fleas, mounting	33
Flies, destroying	12, 81
Flora society	149
Formicidae	50
Frog, burrowing	135
Fungi	74, 225
"Gold-coated" teeth	187
Goodeniaceae	157, 211
Graft, Natural	202
Grape-vine moth	167
Grapes, Flies attacking	139
Insects, Destructive	9, 14, 22, 110
" and disease	39
" " Wattles	56
Insect-trapping flowers	175

INDEX—continued.

Page

Jade	82
Kembla district, Botany	144
Lambertia	141
Lepidoptera	36, 52, 78, 83, 148, 167
Light and deciduous trees	117
Liparid moths	148, 167
Loranthus	135
Mangrove swamp	21
Martynia	34
Miletus	78
Miscellanea Entomologica	174
Mistletoe	135
Mollusca	19, 30, 84
Mosquito	61, 119, 132, 175
" salt-water	132
Mosses	86
Moths	148, 181, 191, 221
Myrmecophilous Lycaenid larvae	177
Natural History Miscellany	64
Nepean River Plants	213
New Zealand Flora	220
Nomeus	166
Odonata	26, 35, 111, 133
Orthoptera	32
Ospreys	111, 216
Parasites	7, 79, 148, 168, 202
Phalaenoides	167
Philocryphus	135
Pines, Australian	59
Plant Association	192
" Life, Variations in	207
Platypus	119
Poliste	140
Preservation of plants	94
Pupation, Moth	191, 221
Relaxing box	135
Reports, Annual	38, 98, 151, 219
Root nodules	192
Samoan Volcanic Eruption	181
Scale, Wax	156
Snail, Noise made by	84
Spiders	23, 118
Streptera	4
Symbionts	138, 195
Teratology	134, 184, 202, 207
"Trap-door" spider	23
Trees and artificial light	117
Tristania	187
Variation in Lambertia	141
Volcanic	181
Wattles	62
" and insects	56, 203
Wax scale	156
Weeds	34
Whale	189
Wild Life Preservation	167, 188
Zanonia	183
"Zoo" Gardens	2, 93, 99

THE
Australian Naturalist.

VOL. II.

JANUARY 28, 1910.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MONTHLY MEETING held at the Technological Museum, Ultimo, on Thursday, 7th October, Mr. J. R. Garland, M.A., Vice-President, in the chair. On the motion of Mr. Finckh, seconded by Mr. Stead, the ordinary business of the meeting was held over.

LECTURE.—Mr. R. T. Baker, F.L.S., gave an exhaustive and interesting lecture on the "Australian Pines," dealing with this valuable group from an economic standpoint. The lecture was profusely illustrated by specimens and lantern slides.

ORDINARY MONTHLY MEETING held at 82 Pitt-street on Thursday, 4th November, Mr. J. R. Garland, M.A., presiding.

NEW MEMBERS.—Misses Coghill, Steffanoni and Brewster were elected Ordinary, and Miss Gladys Froggatt and Master R. Knieff, Junior Members of the Club. The resignation of Dr. Mary Booth, owing to removal to Melbourne, was accepted with regret.

LECTURE.—Mr. W. B. Gurney, Assistant Entomologist, lectured on "Stick Insects and their Allies," illustrating his remarks by means of lantern slides.

EXHIBITS.—Mr. W. B. Gurney, six cases of Orthoptera in illustration of his paper; Mr. C. Coles, five species of Birds of Paradise; Mr. W. G. Harvey, Coleoptera from Mackay, Queensland.

ORDINARY MONTHLY MEETING held at 82 Pitt-street, Thursday, 2nd December, the President in the chair.

ELECTIONS.—Misses J. Gregor, Fletcher, and L. Fletcher, and Messrs. E. Griffiths and D. O. White were elected Ordinary Members of the Club.

A BUSH CALENDAR.—The Hon. Secretary announced the publication of another nature book by a member of the Club, "A Bush Calendar," by Amy E. Mack (Mrs. Launcelot Har-



ison). Mrs. Harrison forwarded a copy for presentation to the Club library.

LECTURE.—Mr. A. S. Le Souëf read a paper, "Notes on Zoo Work." His audience was especially interested in the lantern pictures of new ideas for animals in captivity in various parts of the world.

NOTES ON ZOO WORK.

(*Abstract of Lecture by A. S. Le Souëf, November, 1909.*)
BEING among nature lovers, I will confine my remarks strictly to Animals and Birds, and leave out history and the more uninteresting parts of zoological work.

The Royal Zoological Society of New South Wales started as an acclimatisation body, with the object of introducing useful fauna to the State. Goldfinches, linnets, starlings, Californian quail, yellow-hammers, skylarks, Indian minahs, and ring-necked doves were turned out in the vicinity of Sydney, and all except the quail did well, especially the doves and skylarks, which now add life, beauty, and song to the parks near the city. The only animals introduced were deer, which were turned out in various parts of the State, but have not been of any great use or success. Fish were liberated in many rivers and streams, and included trout, perch, and carp. The present state of the inland fisheries bears tribute to the usefulness of this work.

Coming to the Gardens proper: These were founded in 1882 in their present situation, and have since been gradually brought up to their present stage, and have been throughout very well attended by the public. The collection varies from six to nine hundred specimens, and endeavours are made to maintain these in health and such comfort as is allowed for by the space at the command of the Council. As far as possible the exhibits are arranged in family groups, so as to help the mind in gaining a fair idea of the variations among individual orders. Space has only allowed exhibits to be procured which are strictly interesting to the general public. Australian fauna and smaller animals and birds are not shown to any great extent.

Let us try to follow the history of an animal from its wild state to the cage in the Zoo. Catchers have to go out in the more or less arid regions of Africa, or tropical jungles, or perhaps to the dreary Arctic lands to procure specimens; but, as can be easily imagined, full-grown beasts are very seldom procured, and could not be handled if they were.

So the parents are shot and the young ones taken. These have to be transported and shipped to dealers, chiefly in Europe, from whom they are purchased by the Zoological Gardens, and this means another long and exhausting journey for the exhibit. It can easily be imagined that the drastic change of conditions, with unsuitable food and small, cramped quarters, prove very disastrous to the animal, and it is safe to say that for every specimen exhibited six have been killed in one way or another. However, as soon as they arrive in the Gardens every care is taken to make them as happy and comfortable as the circumstances will permit, though in the present state of the Gardens this does not amount to what could be desired. This brings us to the possibilities of getting animals in a natural state, and as free as possible from any artificial conditions. Up to a few years ago practically nothing was attempted in this way, but Carl Hagenbeck, a very clever German, with his great natural love for wild things, set himself the task of solving this problem in his own private Gardens in Hamburg; and so well has he succeeded that now even the wild Carnivora can be kept in spacious quarters, in every way resembling their natural habitat, where they have ample room, fresh air and sunlight, and, most important of all, no bars between them and the public; for iron bars spell captivity, and to eliminate them is a very great triumph. These compartments are made of stone, with a moat in front, so that the animals can be seen with nothing to stop the view. Then, again, mountain goats and sheep are put on miniature hills, and enjoy their natural surroundings to a great extent, and the Herbivora generally, instead of being enclosed each in his own little paddock, have in common large areas in which to roam. And it is found that they keep to themselves, and no injury results to any of them. Smaller animals have neatly constructed rock cages, or are allowed loose on enclosed trees as occasion requires. Birds have immense wire aviaries, in which they can fly and have a large amount of liberty in the fresh air.

Under these conditions captives do well, and reproduce their kind to an extent which was not possible under the old regime. We hope to follow this course in Sydney immediately good quarters can be procured, where the specimens will be free from the dust and bustle of the city. In passing, it is well to emphasise the fact that wild specimens the world over are rapidly decreasing. In North America the few that remain are shut up in reserves. This system is being followed out in Africa, and specimens are not available

for zoological purposes. In the gardens of fifty years hence it is safe to say that only a small fraction of the animals now shown will be procurable, and I think it likely that the chief plank in the Zoological Gardens of the future will be sea fauna. In getting new Gardens this must be given consideration.

The individual habits of the animals in the Zoo are full of interest and instruction, and well repay study and observation. Perhaps the first general characteristic noticed is playfulness. Almost every specimen denotes a playful spirit in some way or other; even such a cumbrous beast as the elephant often performs tricks quite on its own initiative. The Carnivora, especially the cats and bears, are very fond of playing with a ball or with each other, and it is a common sight to see the cranes dancing around with bits of stick and evidently taking the greatest pleasure in going through the most extraordinary antics.

Animals like company, and if it so happens that we cannot get two or more of one sort, we will have to put in some other variety for a playmate, and sometimes the most unlooked-for friendships are made in this way. I can well remember an instance of an old and very cross lion becoming fast friends with a small black-and-tan terrier which had unwittingly followed a rat into his cage; the two were together for some years in the same cage (until the lion died), and it was curious to see the little dog lying across the big beast's paws.

BIRD NOTES.

(By Launcelot Harrison.)

POSSIBLY owing to the dry season, the North Shore line has been visited this summer by several species which do not usually honour us. Early in spring a large flock of "black magpies" (*Strepera graculina*) haunted the Killara gardens; and a couple of pairs bred in the gullies on the Middle Harbour side. Later on the pretty little white-shouldered caterpillar-eater appeared in considerable numbers, and stayed to breed. Though this bird is a common summer visitor to the western suburbs, where it may be found every year without exception, I have not before seen it on our highlands. Another stranger was the dollar bird, some of which are still here. One pair reared a family in a large red gum in Killara Park. Still another was the mountain thrush, which is now rarely found close to Sydney. I was somewhat surprised to

see one in the head of a gully quite close to the houses of the suburb, and I subsequently saw it feeding a young one just able to fly. Quite close by I found the deserted nest, placed on the broken trunk of a "water gum" (*Tristania*) in the bed of the creek.

As it is the generally recognised theory that young birds acquire their characteristic notes by imitation of their parents, I have sometimes wondered how our various cuckoos, which are reared by all sorts of host species, acquire their cuckoo notes—unless they are taken possession of by their true parents before they have passed the assimilative stage. Towards the end of November I was attracted by the note of a blue wren to some bushes at the back of my house, and to my surprise found that the blue wren's song was issuing from the throat of a young narrow-billed bronze-cuckoo. I watched the bird for some time, and the imitation was exact, the trilling sound of the wren's note being obtained by a tremulous motion of the cuckoo's mandibles. The bird was about my house for some days, in charge of a pair of wrens, and kept up its wren imitation the whole time. This is the only occasion on which I have known a young cuckoo in charge of its foster-parents utter anything more than a single baby call.

The gentlemen who prattle so glibly about the school in wild life would have some hard nuts to crack if they really studied the development of some of our birds. A couple of months ago I took a young laughing jackass from the nest (a gloomy cavern in a white-ants' nest, whence he would have no chance of watching his parents' actions), and brought him home for photographic purposes. At the time of taking its feathers had not developed from their sheaths. It took readily to a meat diet, and grew rapidly, and one day when I had it from its cage to feed, it flew quite steadily to the edge of a tub some three yards away, although it had never stretched its wings before. A few days later it flew a much longer distance on to the roof of a shed. So it is obvious that the bird required no tuition from its parents in the art of flight. It also "laughed" without any particular voice-training, and, most fatal of all to the school theory, towards the end of its stay with me it always carefully killed its piece of already quite dead meat by banging it a number of times against its perch before eating it. This familiar action, for the reason I have already pointed out, could not have been learnt from its parents. The bird is now at large, and looking after itself quite well, so we shall have to fall back on instinct after all.

EGG OF THE LARGE-BILLED BLACK COCKATOO.

To the Editor.

DEAR SIR,—In August last I received from Mr. Edwin Ashby, of Adelaide, an egg of the large-billed black cockatoo (*Calyptorhynchus macrorhynchus*), from Cape Ford, N.T., which he stated was *apparently* undescribed. I exhibited it as such at the September meeting of the Club. In making the digest of the minutes for the October NATURALIST, the qualification was accidentally omitted, and it appeared as the "undescribed egg." I was not in a position to state that it was undescribed, as I had taken no steps to verify Mr. Ashby's note.

Immediately on publication of the journal I received a note from Mr. Dudley Le Souëf, C.M.Z.S., stating that he had described the egg of this species in *The Victorian Naturalist*, Vol. XIX., page 91, and that the type was in Mr. H. L. White's Belltrees collection. I subsequently saw Mr. White, and explained the matter to him. He told me he had written you on the subject, and requested me to ask you to withhold his letter from publication.—Yours, etc.,

LAUNCELOT HARRISON.

Killara, 2/12/09.

REPORTS OF EXCURSIONS.

VISIT TO LANE COVE RIVER.

OCTOBER.—At the invitation of Mr. A. J. Vogan, F.R.G.S., the excursion of the club was held at Mt. Mars, Lane Cove River. The members were met at the Bridge, Lane Cove River, by Mr. Vogan, who took the party for a delightful trip up the too little known upper waters of the Lane Cove. The party was afterwards landed near Mt. Mars, and entertained by Mr. Vogan at afternoon tea. After tea some of the party, headed by Mr. Vogan and Mr. Gurney, started across country collecting specimens en route, and eventually struck the tram at Gore Hill. Some good beetles and specimens of the bush flora then in flower were collected. Insects were not plentiful, everything being rather late this season. Mr. Vogan's kindness and hospitality were highly appreciated by the members.

TRIP TO PENSHURST.

NOVEMBER. — The country around Penshurst is an old naturalist collecting ground. The collector has

the advantage of crossing both Hawkesbury sandstone and Wiannamatta slate country, with their distinctive flora. Mr. Cheel wisely chose this district for the afternoon's collecting, as the bush is being rapidly cleared for suburban residences. Fungi were not plentiful, but members were shown many beautiful lichens, and introduced to a great variety of native flowers and trees. A list of these, seen in flower or in fruit, is appended:—*Ranunculus lappaceus*, Sm. (buttercup); *Ionidium filifolium*, F.M.; *Viola hedveruea*, Labill.; *Tetratheca erecifolia*, Sm.; *Hypericum graminulum*, Forst.; *Linum gallicum* Linn. (an introduced flax); *Desmodium varians*, Eudl.; *Kennedya rubicunda*, Vent.; *Rubus parvifolius*, Linn. (wild raspberry, in fruit); *Cullicoma serratifolia*, Andr.; *Tillaea verticularis*, D.C.; *Leptospermum flavescens*, Sm.; *L. lanigerum*, Sm.; *Callistemon saliguus*, D.C. (young foliage noted); *Eucalyptus pilularis*, Sm.; *E. paniculata*, Sm.; *E. punctata*, D.C.; *E. haemastoma*, Sm.; *Angophora intermedia*, D.C.; *A. lanceolatus*, Cav.; *Syncarpia laurifolia*, Ten.; *Eugenia smithii*, Poir. (Lilipili); *Didiscus incisa*; *Helichrysum apiculatum*, D.C.; *Stylidium graminifolium*, Sw.; *Goodenia hederacea*, Sm. (Ivy-leaved Goodenia); *Mitrasacme polymorpha*, R.Br.; *Ruellia australis*, R. Br.; *Hakea acicularis*, R.Br. (in fruit only); *Grevillea sericea*, R.Br.; *Isopogon anemonifolius*, R.Br. (in fruit); *Poranthera microphylla*, Broug.; *Picinocarpus pinifolius*, Desf.; *Ficus rubigenosa*, Desf. (Port Jackson Fig—growing naturally); *Caesia vittata*, R.Br.

Amongst fungi the following were noted:—*Polystictus sanguineus*, Mey.; *Bovistella aspera*; also one unclassified species.

Lichens were as follow:—*Cladonia pyxidata*, var.; *Parnelia trichotera*, Hul.; *P. limbata*, Laur.

CURRENT LITERATURE.

PART 3, of Vol. XXXIV., of the Proceedings of the Linnean Society of New South Wales was issued on December 3rd, 1909. To this part Mr. T. Harvey Johnston, M.A., B.Sc., contributed two papers, the first "On Some Hæmogregarines from Australian Reptiles." This is a pioneer paper in this field of research, as the subject is one that has received little attention at the hands of specialists. So far, only four of these parasites are known to occur, and they are found in the blood of the diamond-snake, *Python*

spilotes, Lacep.; the native cat, *Dasyurus viverrinus*, Shaw; the marsupial "squirrel," *Petaurus sciureus*, Shaw; and the Northern carpet-snake, *Python amethystina*, Schn. "The Entozoa of Monotremata and Australian Marsupalia" (No. 1) is the title of Mr. Johnston's second paper, and this introduces the reader to additional pioneer work in Australian parasitology. Of these papers, the former is illustrated by two plates. Again, the same author, in collaboration with Dr. J. Burton Cleland, deals with another branch of our parasitic fauna under the title of "Notes on Some Parasitic Protozoa," and this is also illustrated by a plate. Mr. Hedley, F.L.S., contributes a paper on "Mollusca from the Hope Islands," and this is illustrated by four admirable plates by that accomplished artist, Miss Winifred West. Mr. E. J. Goddard, B.A., B.Sc., continues his papers on Australian *Hirudinea* (Part III., pls. xlv.-xlv.), and commences another series on "Australian Freshwater Polyzoa" (pl. xlvii.). The issue under notice introduces a new Australian worker in the cause of entomological science, and, judging by the quality of the work produced, one who is destined to be a tower of strength to students in Coleoptera. The paper referred to is a "Revision of the *Amycteridae*," by E. W. Ferguson, M.B., Ch.M. No. 15 of Messrs. J. H. Maiden and E. Bettle's "Notes from the Botanic Gardens" concludes this number. In the Proceedings of the Royal Society of N.S.W. for 1909, Mr. T. Harvey Johnston has, in conjunction with Dr. Cleland, continued his studies on Australian parasitology by four papers on Cestodes and blood parasites from birds and reptiles. Altogether, as denoting scientific literary activity in 1909, forty-two papers on zoology were published in the course of the year in Sydney alone.

NOTES AND COMMENTS.

"A BUSH CALENDAR."—This is the title of a dainty little book that made its appearance just prior to Christmas. And no time could have been more happily chosen, for it is just the sort of little book that one looks forward to at Christmas time, especially when one has friends at a distance to whom he or she desires to send a permanent reminder of friendship and goodwill. Miss Amy E. Mack (Mrs. Launcelot Harrison) had many admirers of her literary skill and pleasant manner of treating things prior to the publication of "A

Bush Calendar;" but a newspaper article is one thing, and a permanent record in the shape of a book is another. And it was just such a little work as this for which the author's many friends were waiting; nor have they been disappointed. In turning over the pages of "A Bush Calendar," the reader almost feels that he or she can hear the birds depicted there twittering; that he or she can detect the fragrance and freshness of the bush. Admirably written, it is equally admirably illustrated. Indeed, it seems almost impossible to pick out one picture that excels another either in fidelity to Nature or delicacy of treatment. The book is aptly termed "A Bush Calendar," for it commences with early spring (August), when everything is just coming into life, and month by month takes one through the year to the close of winter (July). For each month there is a list of plants that are to be found blooming, a list of birds arriving or departing, and, as the case may be, a list of those breeding. That every month and every season has its own particular charm, and that the enjoyment of these charms are within the reach of all, "A Bush Calendar" bears eloquent testimony. ["A Bush Calendar," by Amy E. Mack; Angus and Robertson, Sydney, publishers; 3s. 6d.]

DESTRUCTIVE INSECTS.—Mr. C. French, F.L.S., F.E.S., Government Entomologist of Victoria, has just issued Part IV. of his "Handbook to the Destructive Insects of Victoria." [Melbourne: Osboldstone and Co., pp. 195, price 2s. 6d.]. The work contains brief descriptions and details of the life-histories of a number of destructive insects common to Victoria, and, for that matter, New South Wales, and these are illustrated by twenty coloured plates, all of which should be helpful to the husbandman. In addition to the above, the work contains reprints of the Vegetation Diseases Acts, and coloured illustrations, and popular descriptions of a number of our native feathered friends that render valuable assistance by the destruction of orchard and garden insects. The work is one that will repay perusal, and it is also one that should be in the library of every naturalist. The Victorian Government is doing good work in publishing the results of Mr. French's mature experience, but it is a pity that such a long period of time is allowed to elapse between the publication of the different parts. Mr. French tells us that he has manuscript and plates ready and waiting for Parts V. and VI., but he will be a veritable patriarch when the latter part is published—that is, if the present rate of progress be observed, a fact which is not very encouraging to the author should he be contemplating an additional number,

to be known as Part VII. The part at present under notice contains an appendix on "Materials in Use for the Destruction of Noxious Insects."

PROPOSED CAMP.—It is proposed to "hold" a camp at Easter. Arrangements for the carrying out of this project are now being considered by the Council. As soon as locality and details have been perfected members will be duly informed. On a former occasion when members went into camp, the turn-out was a great success. In the meantime, those who regard such a project with favour will materially assist if they intimate approval to the Hon. Secretary.

ADDITIONS TO THE LIBRARY.—Geological Survey of N.S.W., Vol. VIII.; Forty-third Annual Report of Museum and Lecture Rooms Syndicate, Cambridge; Proc. U. States Nat. Museum, XXXIII.-XXXV.; Smithsonian Institute—Some New S. American Land Shells; Contributions from U.S. National Herbarium, Vol. XII., Parts 5-9; Catalogue of Type Specimens of Mammals in the U.S. National Museum; A Critical Survey of Troost's Unpublished MSS. on the Crinoids of Tennessee; Observations of Live Whales; American Ferns—Group of *Dryopteris opposita*; Australian Photographic Journal, XVIII., Nos. 208-210; Mitth. aus dem Zool. Museum, Berlin; Tasmanian Naturalist, II., Part 2; Proc. Royal Soc. Victoria, XXII., Part 1; Victorian Naturalist, XXVI., Parts 5-8; Selberne Magazine, April-Dec., 1909; Dept. Fisheries Annual Report.

AUSTRALIAN MUSEUM.—One of the new and spacious galleries of this institution has now been thrown open to the general public, and in this the ethnological student will find much to interest him. The collection is almost typically Australian, or, at any rate, of Australian interest, for it contains not only a rare collection of Cook relics, but also much illustrative of the handicraft of the Australian aborigine, a study of which must dispel the old and oft-quoted fable that the blackfellows of this island continent were remarkable, chiefly, as being lacking in intellectual power. Judged by European standards, probably they were, yet no one, who has studied their habits and bush-craft, their traditions and folk-lore, and their marvellous adaptability to circumstances and environment, could conscientiously assert that they were either dull or uninteresting. Much has been learned and made known of late years by capable and enthusiastic anthropologists of the life-history, social and, if such a term be permissible, the civic economy of a race soon destined to

exist in name and history only. Viewed from this latter aspect, the ethnological collections in the Australian Museum at Sydney—and kindred institutions in other parts of the Commonwealth—are of the highest anthropological importance, and are altogether beyond the scope of value as defined by pounds, shillings and pence.

DEATH OF AN EMINENT ORNITHOLOGIST.—News was received, in the early part of January, of the demise of R. Bowdler Sharp, LL.D., Assistant Keeper of the Department of Zoology of the British Museum. The late Dr. Sharp was undoubtedly the greatest ornithologist of his age, and its most prolific writer. Indeed, few men have contributed nearly so much to scientific literature as he, but the great keynote to his success was accuracy. No fact published by him was too small or too insignificant to verify. The late Dr. Sharp was appointed Librarian to the Zoological Society of London in January, 1867, which position he resigned in 1872; in September of the same year he was appointed Senior Assistant in the Department of Zoology, British Museum, and Assistant Keeper in 1895. Dr. Sharp was in his 63rd year at the time of his death.

DEMISE OF A WELL-KNOWN ENTOMOLOGIST.—The November number of *The Entomologists' Monthly Magazine* (London) contains the announcement of the death of James Harold Bailey, M.B., Ch.B. In early life this distinguished entomologist evinced a preference for the Lepidoptera, but gradually transferred his attention to the study of the Coleoptera. He was a well-known contributor to entomological literature, and at the time of his death had all but completed a work on Manx Coleoptera. It is not at all improbable that the MS. of this posthumous work will be acquired and published by the Manx Natural History and Antiquarian Society.

THE ARAB AND THE BIRD.—Brehm, the eminent naturalist, thus wrote:—"Birds are perfectly aware that they can implicitly trust the Arab. No young scamp ever thinks of robbing their nest; no sportsman is lying in wait near their bower to kill the newly-fledged youngsters. In the eyes of the Arab, the naturalist, even, who only destroys an occasional pair of birds, or takes an egg or two for the purposes of science, is not held to be excused. They have often called down the curse of heaven upon my head for so doing; and, indeed, my brown servants used to tremble for me, as they said that the curse was bound to take effect. I never abused them in return, for I could not but admire the feelings which inspired them on those occasions, sentiments so noble, and

so deeply founded, that I have always dreaded the curse, despite myself." In these days of bird-nesting boys, and indiscriminate shooting of our feathered friends in the name of sport and commerce, the above is cheerful reading. Even some so-called naturalists are not blood-guiltless in this respect, for more than are absolutely necessary for science fall victims to the gun; and some even rob birds of more clutches than is warranted or justifiable. The Wild Life Preservation Society of New South Wales has been established to correct this sort of thing.

THE LATE DR. W. BRODIE.—By the demise of Dr. Wm. Brodie, Canadian entomology has suffered a severe loss. The late doctor was a son of an old Canadian pioneer—one of those sturdy, hardworking, indefatigable men who have done so much good work in the distant out-posts of our great Empire. Dr. Wm. Brodie went to Canada with his parents when quite a child. His father established himself as a farmer in the County of York, about 30 miles from Toronto, where he hewed out of the virgin forest a home for his family. From his earliest years Dr. Brodie exhibited an ardent love for Nature in all its aspects. His favourite study, however, was entomology. Galls and their inmates had a special fascination for him, and he made large collections of these and many other forms of insect life. But, whilst he was a good collector, he was also a good writer, and contributed extensively to the pages of *The Canadian Entomologist*, his papers on insect galls to that journal being of the highest scientific and economic importance. In 1903 he retired from the practice of dentistry, and took charge of the Biological Department of the Provincial Museum. He was 78 years of age at his death.

FLIES.—The best exterminating agent (says *The Lancet*) is a weak solution of formaldehyde in water, say two teaspoonfuls to the pint, and this experience has been confirmed by others. It would appear that flies are attracted by a weak solution of formaldehyde, which they drink. Some die in the water, others get as far only as the immediate vicinity of the plate of water, but all ultimately succumb, and where they occur in large numbers hundreds may be swept from the floor. It is consoling to know that by this method the flies have died under a dose of a fluid which is fatal to disease organisms, a fluid also which is inoffensive and, for practical purposes, non-poisonous. The method at once provides a means of diminishing the scourge, and of securing to some extent, what is most desirable, the disinfection of the slain.

THE
Australian Naturalist.

VOL. II.

APRIL 7, 1910.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The ordinary meeting was held in the Board Room, 82 Pitt-street, on Thursday, 3rd February, 1910, Mr. J. R. Garland, M.A., Vice-President, in the chair.

CAMP.—Announcement was made of a proposal to hold a Camp at Narrabeen during the Easter holidays, and members willing to take part were asked to hand in their names.

ORDINARY MEETING.—The ordinary meeting was held at 82 Pitt-street, on Wednesday, 9th March, the President, Mr. W. W. Froggatt, F.L.S., in the chair.

BUSINESS.—Microscopes having been brought by Messrs. Garland, Gurney, Rainbow, and Finckh, a number of subjects were exhibited in turn, and explained by the several gentlemen named.

PAPER.—Mr. R. H. Cambage, F.L.S., read a paper on "Botany in Relation to Geology and Physiography."

ENTOMOLOGICAL NOTES AND EXHIBITS.

MR. W. W. FROGGATT exhibited a curious Australian fly and, in doing so, remarked that some honey-comb was received from Mr. S. S. Hart, Myamily, Condobolin, which, instead of young bees, contained the pupal cases of a Syrphid fly, which had evidently devoured the young bees and pupated in the cells. This remarkable looking fly, *Sphryximorpha australis*, Macq., mimics, to a wonderful degree, the form and colouration of one of our common clay-nest wasps (*Odynerus* sp.) The outward wasp-like appearance of this fly may enable it to enter the bee hive, whereas if it were not so disguised, it would be seized and killed by the bees.

The weevil (*Euthyrrihnus meditabundus*, Fab.), frequents the stems of the Bangalow palms which have been

damaged by bush fires and deposits its eggs in the dying trunks. The larvae bore into and feed upon the stems. Inspector Gallard, of the Agricultural Department, collected a number of these beetles at Narara, near Gosford, and obtained numbers of the three Hymenopterous parasites, which were laying their eggs in the Coleopterus larvae. He not only watched them at work but also bred the parasites from the beetle larvae.

The sheep nasal fly (*Oestrus ovis*) was also shown that had been bred from a larva sent from Koorawatha, taken from the head of a sheep. Though the larva has been recorded this was the first fly bred out under observation.

A lucerne seed pest was also exhibited, Mr. Froggatt explaining that when examining the entomological specimens in Washington, in 1907, Professor Webster pointed out a very destructive little seed-eating wasp that damaged lucerne seed by puncturing the growing seed and depositing its egg under the skin. The exhibitor called attention to this seed pest in his report and in less than six months afterwards received specimens of lucerne seed from several different districts in N. S. Wales, infested with the seed-eating parasite. It was described by Dr. Howard under the name of *Bruchophagus funebus*.

A very handsome fungus, *Phallus* sp., had been received by Mr. Froggatt with a number of other specimens from Mr. Hicky, manager of Pepesala Plantation, Solomon Islands. About the same time Mr. O. G. Lloyd, of the United States, sent the exhibitor his illustrated book on these curious fungi, of which we have many interesting species in Australia.

Miss Gladys Froggatt exhibited a small collection of insects, chiefly Coleoptera, taken at Penrose, on the Southern line, during the Christmas holidays.

Mr. I. L. Froggatt exhibited some Tertiary fossils. It was explained that these occur in basins in small patches, which are met with from Mittagong onwards. These particular specimens were found about eight miles from Wingelo, a few stations beyond Bundanoon. All the species are allied to modern existing types.

Master Oliver Edwards exhibited a snake, *Denisonia nigrescens*, from Candelo.

Mr. L. Harrison, eggs of *Merula vinitincta*, and *Zosterops strenua*, from Lord Howe Island.

BOTANY IN RELATION TO GEOLOGY AND
PHYSIOGRAPHY.)

(Note on Paper by R. H. Cambage, F.L.S.)

THE matter contained in Mr. Cambage's paper was not new, as it has appeared in various papers published by him in the Proceedings of the Linnean Society of New South Wales, and was summarised in popular form as a Presidential Address to the N.S.W. Institute of Surveyors, and printed in the "Surveyor" for January, 1908. Owing, however, to its extreme suggestive value to a popular club, the Council asked Mr. Cambage to repeat it at one of our meetings, and he kindly consented to do so at the March meeting.

Mr. Cambage's subject amounts to a zoogeographic scheme for the State of New South Wales, founded on a study of the botany. He divides the State into four broad divisions, each with certain typical flora:—

(a) Coastal area, from the sea to the dividing range. This area is supplied with an abundant rainfall, and the vegetation is, in consequence, very rich. The western boundary of the area is formed by the western limit of *Eucalyptus amygdalina*. The chief point of interest about it is the breaking through of the Hunter Valley at a point where the mountain area is narrowed down to a minimum, and the irruption of the flora and fauna of the western slope area to the coast.

(b) Mountain area, comprising the dividing range with its buttresses and foothills. The botanical boundaries are *Eucalyptus amygdalina* on the east, and the eastern line of *Eucalyptus albens* on the west, while a *Eucalypt* confined to this area is *E. coriacea*.

(c) Western slopes, bounded roughly by a line drawn from Corowa to Dubbo, thence between Warialda and Moree to the Macintyre. *Eucalyptus albens* is typical of the area, which is bounded by the western limit of this species.

(d) The interior, chiefly remarkable for the mallee *Eucalypts*, and a great number of *Acacias*.

Incidentally Mr. Cambage discussed the effects of aspect, temperature, and geological formation upon the botanical features of a district, and quoted many striking examples.

The paper as a whole suggests many fields of labour to popular workers, particularly in the direction of finding out how far Mr. Cambage's botanical division is supported by the distribution of mammals, birds, and insects.

BIRD NOTES.

(By L. Harrison.)

THE Black-eared Cuckoo (*Mesocalius palliolatus*): This rather rare cuckoo is typically an inhabitant of the dryer interior, whence most of the specimens known have been obtained. It was first recorded for County Cumberland from an immature female obtained by myself near Brookvale, Manly, in 1905, which is still, as far as I know, the only specimen actually obtained in the country. But abundant evidence that the bird visits the coast is afforded by the discovery of three eggs of this species by Messrs. H. Keane and P. Gilbert, two at Flemington and one at Blacktown. Mr. H. L. White also obtained an egg at Belltrees, near Scone. The host species in all four cases was the little field wren (*Chthonicola sagittata*), the egg of which approximates closely in colour, but not in shape, to that of the cuckoo.

Note of "Morepork" (*Podargus strigoides*): This bird derives its popular name from the fact that the note of the boobook owl is generally attributed to it. The general public is beginning to know better now, though these old beliefs die hard, but since the old belief has been resigned, there has been a great deal of popular confusion as to what the note of the *Podargus* really is. I cannot understand why this should be so, as correct descriptions have been published, and the bird, although nocturnal, is very common and easy to observe. The note is described by Campbell as a "rapid pulsating hoot" but hoot is hardly a good word. It may be imitated by almost closing the lips and repeating the syllable "oum" rapidly at a fairly high pitch, a good deal higher than the well-known "boom" of the painted quail. The greatest number of repetitions of the note I have seen recorded is twenty-five (Campbell; Dr. Macgillavray says twenty or more) but since I have been sleeping on an open verandah in our heavily-timbered highlands, I have found the number to be frequently much larger. One night a month or more ago I was roused by the note of a *Podargus* close by, and as it seemed to be giving a very continuous utterance, I began to count. It uttered 34 calls, and after a few seconds' interval, 53. I fell asleep again just here, and in the morning was not sure whether I might not have dreamed it all. A few nights ago, however, I was awake towards morning when a bird commenced to call close by, and I recorded its series. First one not counted, then 46, 15, 33, 56, 69, 73, 50, 36, with a few seconds interval only between each succession of calls, the whole occupying, as far as I could judge, not more than five or six minutes.

Autumn breeding season: Although most of our birds confine themselves to the spring months for breeding there are a few that have a well-defined second breeding season in the autumn, the most prominent being the New Holland and white-checked honey-eaters, the tawny-crowned honey-eater, the red-rumped ground-wren (*Hylacola*) and the red-browed and chestnut-breasted finches. Nests of the honey-eaters mentioned may be found sporadically throughout the year, but the bulk of these birds breed in the early spring, and again towards the end of March and during April. This second breeding season seems to be decided by the flowering of the Banksias (*B. marginata* and *B. ericifolia*). As soon as these shrubs are in full bloom, numbers of honey-eaters' nests may be found. I have inspected several nests of the three species named during the last two weeks (March 20th), and also a number of nests of the red-browed finch. In many cases these nests had become sodden by rain, and had been deserted by the owners. The nests and eggs of the white-checked and New Holland honey-eaters approximate closely, but Mr. E. H. Webb drew my attention some years ago to an infallible method of distinguishing them if the birds are not present, which I have never seen printed. The nests of both species are lined with the red velvety material from the Banksia cones, but, while the New Holland lines the sides of the nest, the white-checked species simply places a pad of lining material in the bottom. I found a nest of the introduced Indian dove (*Turtur suratensis*) on the 6th of March, as this species also possesses autumnal breeding habits.

PUBLICATIONS RECEIVED.

THE EMU. January number. This is the official organ of the Australasian Ornithologists' Union. The illustrations are excellent and the articles most informing. Those of our members interested in bird study should never omit to peruse this publication.

The Selborne Magazine. January number. This is the organ of The Selborne Society and an English publication. It contains short notes on subjects of general interest to naturalists.

The Victorian Naturalist, March number, contains an interesting illustrated article on "Victorian Vegetation in the Melbourne Botanic Gardens."

The Queensland Naturalist. December 1909 number contains the President's address on C. R. Darwin and articles on

"Insect Protective Colouring and Mimicry with some Australian Examples" and "The Queensland Spirogyra."

Records of the Western Australian Museum and Art Gallery, vol 1., part 1. This publication contains most valuable information on the Fossil Marsupials of Western Australia accompanied by excellent illustrations.

The above numbers are now in the library.

EXCURSION.

TRIP TO DUCK CREEK.

FEBRUARY.—The excursion to Duck Creek, Clyde, on 5th February, under the leadership of Mr. A. R. McCulloch, of the Australian Museum, proved a great success. The attendance numbered nearly thirty, the day was a perfect one and our leader proved perfection itself. We owe much to Mr. McCulloch for one of the pleasantest and most profitable afternoons that we have had. We were first introduced to the Rotifer, *Melicerta ringens*, possessing similar characteristics and behaving in much the same manner as the Rotifers so well described by Dr. Murray, of Shackleton's Expedition. Then we secured excellent specimens of the carnivorous water plant *Utricularia vulgaris*. Its method of securing its prey, its peculiar form, and characteristics were described. The leader told us of fighting fishes hatched out in a tank in which *Utricularia* was growing which all fell victims to this carnivorous plant. The fish was caught by the tail, slowly drawn in and digested in the course of about four hours. In Darwin's "Insectivorous Plants," page 395, will be found a chapter giving a most minute and fascinating account of *Utricularia* its habits and construction.

We were fortunate enough to secure a species of *Marsilia*, a water plant with flowers like a water lily but which seeds only when left stranded by the water drying up. Fresh water shrimps *Xiphocaris compressa* were plentiful. Mr. McCulloch informed the party that he had found them in streams 2000 feet above sea level. They are widely distributed and are found in Lord Howe and Norfolk Islands, Japan, New South Wales, Tasmania and other lands. These are one of the earliest forms of prawns and probably came originally from Japan when that country was contained within the land of the Molanesian Plateau. Mr. McCulloch had discovered them at Narrabri in the middle of December. A common medicinal

leech, *Hirudo* sp., was taken and two fine specimens of the water spider, *Dolomedes facetus*, one of them in the act of devouring a small green spider. There was an abundance of the little fish, the "Blue Eye," *Pseudomugil signifier*, which led up to an interesting account by the leader of the development of the tail in fishes. Two or three specimens of a pond snail, *Isodora* sp., were taken. It is not generally known that this snail acts as host to the sheep fluke. There is an interesting account of this on page 178, "Nature Studies in Australia," by Gillies and Hall, a charming introductory book for young naturalists. The magpie lark is fond of this snail, and, therefore, helps to keep down sheep fluke. Each member carried home something of interest and we look forward with pleasure to the next occasion when Mr. McCulloch will lead us.

E. S. EDWARDS.

THE EVOLUTION OF THE QUEENSLAND COAST.

(By C. Hedley, F.L.S.)

UNDER this heading Mr. Hedley said in his presidential address at the Brisbane Session of the Australasian Association for the Advancement of Science:—

The uniformity of the Indo-Pacific marine fauna is a theme of text-books. From the Red Sea to the Hawaiian Islands is an enormous distance, yet the marine fauna of this belt maintains a constant aspect and numerous species range throughout. This Indo-Pacific Province is subdivided into regions, among which the Solanderian, as I have termed that under consideration, is as distinct as any. On the south the Queensland fauna is limited by the cooler waters of New South Wales, and on the north the volume of fresh water issuing from the Fly and neighbouring rivers is an impediment to emigration and immigration.

A considerable proportion of our fauna is as yet unknown abroad. Further research will, however, alter the proportion of epidemic forms both by the discovery of Queensland forms beyond our limits, and by the recognition in our waters of species described from Japan, the Philippines, and elsewhere. But the completed returns will follow the direction indicated by incomplete data. We note the absence from our beaches of several genera, such as *Harpa*, which otherwise range over the whole Indo-Pacific area. *Cyproea mauritiana*, one of the commonest and widest-spread Indo-Pacific forms,

is yet one of the rarest Queensland shells, presumably a recent immigrant not yet established.

A glance at the physical evolution of the Coral Sea and east coast of Queensland, may suggest a clue to the isolation and peculiarity of our fauna.

According to Neumayr (Denkschr. k. Akad. d. Wiss. Wien., Math., Naturw. cl. L., Abth. I., Karte I.), a meridional crease in the earth's crust produced in Jurassic times a gulf, which he called the Gulf of Queensland, whose western shore transgressed the present east Australian coast. Enlarging through geological cycles this gulf grew into what we now know as the Tasman and the Coral Seas.

South of the Louisiades, and east of Cape Melville, there occurred a sink which I venture to suggest originated in the Mesozoic, and increased during the whole Tertiary Period. It developed into the Carpenter Deep of modern geographers. Our knowledge of this basin is drawn from the observations of the "Challenger." In a traverse of 1,000 miles this great basin preserves an unbroken depth of more than 2,000 fathoms. Temperature readings show it to be enclosed by an unmapped rim, whose lowest point is 1,300 fathoms.

As the Mesozoic sink enlarged its periphery it became a dominant factor in land configuration. First, it broke through an older inner earth fold of which New Caledonia and the Louisiades are relics. Then continuing its work to the eastwards, it submerged a younger outer continental ridge on which the Solomons stand. Westerly it crumpled up the former coast of North Queensland, and, by a furthest western effort, broke upon Torres Strait.

While the Coral Sea was yet a prolongation of the old Gulf, it offered a refuge to old forms of life. The low latitude afforded a warm unchangeable climate, and the surrounding continent secluded its inhabitants from the incursion and competition of other tropical fauna. When, however, continued subsidence to the east at last burst through the Melanesian Plateau, a flood of active competitors must have swept in from the open Pacific. This reached the Queensland coast either by creeping along the land round the Papuan Gulf or by direct, usually larval, transit across the Coral Sea.

With the opening of Torres Strait, and the consequent outgoing current, the Queensland fauna was spread along North Australia to the Moluccas. By this route there escaped such forms as *Trigonia*, *Nautilus*, *Meleagrina maxima*, and *Megalatractus*. Had such been retained east of Torres Strait they would have greatly heightened the peculiarity of the Solanderian fauna.

THE MANGROVE SWAMP.

(By C. Hedley, F.L.S.)

In his presidential address before the Biological Section of the Australian Association for the Advancement of Science, Mr. Hedley remarked:—

It has been the fashion to regard a mangrove swamp as a noisome, repulsive, and unpleasant place. But I find it pretty, interesting, and attractive. Looking down from a hilltop, the mangrove swamp stretches below like some vast green meadow, and if the tide be full the green is veined with silver. Transported to the silver streak one may row up a long green lane hedged in by walls of dense and glossy foliage.

To my taste, the mangrove flora is both quaint and beautiful. A delightful recollection of bygone years is a stream winding through a glorious avenue of dwarf Nipa palms, whose lordly fronds arched over 30 ft. of water. Again, I have a picture in my mind's eye of still water, in the foreground, then an expanse of brown mud, where a litter of calling crabs have burrowed; they raise the defiant claw, and illumine the mud bank with vivid scarlet or orange patches; behind, the hedge of mangrove advancing on great stilt roots of hoops arching from a complex of great and greater hoops. Above and beyond a background of dark and glossy foliage massed like an orange grove.

In adverse climates the pioneer of the mangrove forest is *Avicennia*, which as a dwarfed bush struggles south to New Zealand and South Australia. Before the Queensland border is reached, first *Aegiceras* and the *Rhizophora* has joined it and going north the forest gains recruits with every few degrees of latitude.

For protection against wind and weather the mangrove forest is girt with the tough, firm-rooted *Rhizophora*. Behind its shelter grow the weaker trees. Where the water turns from brackish to fresh is the sweet-smelling *Aegiceras*. A delightful chapter in the story of this weird world is Dr. H. B. Guppy's account of the fructification of *Rhizophora*.

NOTES AND COMMENTS.

NECROLOGY.—One by one the old school of naturalists are being removed by the hand of time. Included amongst these are Professor Gustav Kraatz, who was for years prior to his demise, the world's greatest authority on the Cetonidae, and Dr. Ludwig Koch, the well-known Arachnologist. In this

respect the name of the former was familiar to Australian Coleopterists, as a number of our native species were described by him. The professor was, at the time of his death (November 2nd, 1909), President of the Entomological Society of Germany. Dr. Ludwig Koch is better known to Australian naturalists as the author of the ponderous monograph, "Die Arachniden des Australiens," a work comprised in two volumes of letterpress and one of plates, and containing descriptions and delineations of a vast number of Australian spiders. Owing to ophthalmic troubles the distinguished author was compelled to retire from the active pursuit of his studies, and the concluding part of vol. ii., of the work just quoted, had to be taken in hand by Count von Kersterling. Some time after the completion of "Die Arachniden des Australiens, a fourth, or supplementary, volume was issued, consisting of text and plate, and this was also undertaken by the Count on behalf of the unfortunate (and now blind) Dr. Koch. In addition to the monograph referred to above, Dr. Ludwig Koch was author of several other monographs and quite a number of smaller memoirs published in the journals of continental learned societies. The death is also announced of Mr. Alexander Agassiz, the well-known naturalist, aged 74 years. The deceased gentleman was the son of the more celebrated Professor Louis Agassiz. Alexander accompanied his father to the United States from Europe, in childhood, and was educated at Harvard University. His bent was towards natural history, and at an early age he devoted himself to a study of sea forms, although for a period he was superintendent of the Calumet and Hecla Copper mines, Lake Superior. He was engaged in the United States coast survey, and subsequently became curator of the Museum of Comparative Zoology, at Harvard. Mr. Agassiz conducted explorations of the coral reefs of the Hawaiian Islands, 1899, of the Great Barrier Reef of Australia in 1898, and of the Fiji Islands in 1897. And among deep sea explorations were those of the Panamic region and of the tropical Pacific. He published a number of memoirs on coral reefs, Acalephs, worms, fishes, etc.

THE COTTONY-CUSHION SCALE.—This insect (*Icerya purchasi*, Mask.), which fortunately is not a pest with us in Australia—its home—has now made its appearance in the Eastern Mediterranean region. The invasion of this Coccid is dreaded everywhere. In Australia natural enemies have succeeded in keeping it in check, but in those countries having an equable climate, where it has made its home, it has gained an unenviable reputation. Some years ago, having been accidentally

introduced into California, it nearly succeeded in stamping out the citrus fruit industry, and it was only after much study, great expense, and the introduction of predatory foes from Australia that it was suppressed.

LINNEAN SOCIETY.—Mr. C. Hedley, F.L.S., a former president of the Naturalist's Club, has been again elected to the chair of the Linnean Society of New South Wales.

MACLEAY FELLOWSHIPS.—In his Presidential address to the members of the Linnean Society of N.S.W., Mr. Hedley said:—"In discharge of the trust imposed on us by the Founder, and mindful of these words by President Stephens, "on satisfactory proof being given to the Council that the holder has laboured during the preceding term with earnestness, perseverance and success," Dr. Petrie, Mr. Goddard, and Mr. Cotton were approved and re-appointed for the ensuing year as Linnean Macleay Fellows." Mr. Goddard is one of our members, and has our heartiest congratulations.

TRAP-DOOR SPIDER AND MATCH-BOX LID.—Mr. C. F. Bolton, of Wagga, communicated some little time ago, the following interesting note:—"The Murrumbidgee Pastoral and Agricultural Show Ground, like most places of public resort, is liberally bestrewn with the bottoms of match-boxes like the one herewith. When paying a visit of inspection to the grounds as a member of the Works Sub-committee, I noticed a bottom of a match-box move. On examination I found a large brown earth spider had utilised it as a lid or door to his hole, instead of constructing a lid for himself as is the custom of these insects. It had formed a hinge of its web and attached it to the match-box lid and to the fine rootlets and earth, thus at very little labour and trouble he provided himself with an effective door to his home." Mr. W. W. Froggatt, F.L.S., states that he once saw a threepenny piece utilised as a lid.

CURRENT LITERATURE.—Part IV., Vol. xxxiv., of "Proceedings of the Linnean Society of New South Wales," just issued, is of peculiar interest to Australian biological students. The first paper is entitled "Revision of the Australian Curculionidae belonging to the sub-family Cryptorhynchides, Part X. This contribution, like so many others by the author, Mr. Arthur M. Lea, is severely technical; indeed, from its very nature it could not be otherwise, but it is of great importance to the student, because the copious notes and comparisons, with affinities, must be the means of aiding in the clearing up of many doubtful points. Naturally, the paper contains descriptions of a number of species new to science. Students of Australian avi-fauna will welcome the bright and interesting paper by Mr. A. F. Bassett Hull

on "The Birds of Lord Howe and Norfolk Islands." This essay, which is illustrated by four plates, contains a list of 79 species, some of which, however, as the author points out, are only visitants. Numerous notes on nests and eggs are given, as also the nature of surroundings of localities chosen for nesting purposes. Mr. Hull gives a tabulated list of species which, to the best of his knowledge, actually breed on the islands under discussion. Of the 79 species recorded, five occur on both Lord Howe and Norfolk Islands, and also the Australian mainland; one, Lord Howe Island and Australia; five, Norfolk Island and Australia; four, Lord Howe and Norfolk Islands, Australia, and New Zealand; four, Norfolk Island, Australia, and New Zealand; one is peculiar to Lord Howe Island only; three to Norfolk Island only; whilst eight are peculiar only to Lord Howe and Norfolk Islands. "Studies in the Life-Histories of Australian Odonata, No. 3, Notes on a New Species of *Phyllopetalia*; with description of Nymph and Imago," by R. J. Tillyard, M.A., F.E.S., is another of this author's valuable contributions to a knowledge of our indigenous dragon-flies. This paper, however, is of more than usual interest, because it not only establishes Mr. Tillyard's previous announcement of the occurrence of the Chilian species, *Petalia apollo*, Selys, in Australia—a statement which had been received with some misgiving by European Odonatologists—but it also contains the description of the first recorded larva ever found of the remarkable *Petalia* group of Odonata. This latter Mr. Tillyard was enabled to breed out, with the result that a species new to science was obtained, and for which he proposes the name *Phyllopetalia patricia*. The larva was collected by Mr. Keith Brown at Leura Creek, Blue Mountains. This paper is illustrated by a plate and figures in the text. Mr. E. J. Goddard, B.A., B.Sc., has a "Contribution to our Knowledge of Australian Hirudinea" (Part IV.), and this is also illustrated by three plates and some text figures. Like Mr. Lea's paper, this is also severely technical, but it is one that will be of value to students of this group of animals. If the zoologists are well catered for in this part of the "Proceedings," the geologists have also come in for a share of attention, and by such well-known men as Dr. Jenson, Mr. Leo Cotton, B.A., B.Sc., and Dr. W. G. Woolnough, F.G.S. Of this series the first is on "The Variable Character of the Vegetation on Basalt Soils"; the second, "The Tin Deposits of New England, N.S.W., Part I.—the Elsmore-Tingha District" (six plates and eleven text figures); and the third, "The General Geology of Marulan and Tallong, N.S.W." (five plates and one figure in the text).

THE
Australian Naturalist.

VOL. II. JULY 7, 1910.

PART 3.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The ordinary meeting was held at the Board Room, Vickery's Chambers, 82 Pitt-street, on Thursday, 7th April, Mr. W. W. Froggatt, F.L.S., in the chair.

HON. SECRETARY.—The resignation of Mr. L. Harrison, as Hon. Secretary, was accepted with regret on the motion of Mr. Finckh, seconded by Mr. Steel, and it was announced that Mr. E. S. Edwards, M.A., had accepted the vacant position, having already been appointed by the Council of the Club.

GREETINGS.—Mr. Steel, F.L.S., conveyed to the Club the greeting of the Victorian Naturalists' Club.

EXHIBITS.—Mr. Hamblin exhibited fossils from marine beds, Bundanoon. Mr. Finckh showed two specimens of the snails *Helix aspera* and *Helix cellaris*; Mr. W. W. Froggatt exhibited a Gecko, *Dactylus platurus*, and two very fine specimens of Carabidae from New Guinea, described by D'Alberti in his book on New Guinea. Mr. L. Harrison exhibited some splendid eggs of the Eastern Bower Bird (Cooktown District, N.Q.), Tooth Billed Bower Bird (Billenderker Range, N.Q.), Spotted Cat Bird (Atherton District, N.Q.), Golden Bower Bird (Billenderker Range, N.Q.), Victoria Rifle Bird (Atherton District, N.Q.), Great Bower Bird (Port Keats, N.T.), Satin Bower Bird (Upper Hunter, N.S.W.), Regent Bower Bird (Richmond River, N.S.W.), and Cat Bird (Clarence River, N.S.W.)

ORDINARY MEETING.—The ordinary meeting held in the Board Room, Vickery's Chambers, 82 Pitt-street, on Thursday, 5th May, 1910. Mr. W. W. Froggatt, F.L.S., in the chair.

ELECTION.—Dr. H. I. Jensen was elected a member of the Club.

LECTURE.—Mr. R. J. Tillyard, M.A., delivered a lecture on "Dragonflies." The lecture was a most interesting one, and on the motion of Mr. Garland, seconded by Mr. Edwards, a cordial vote of thanks was accorded the lecturer.

EXHIBITS.—The President, Mr. Froggatt, exhibited a Longicorn beetle from the Solomon Islands and two interesting books on Natural History:—(1) "The Voyager's Com-

panion or The Shell Collectors," by John Mawe, London, 1801 (price 5/-); (2) "Episodes of Insect Life, 1850." Mr. Hamblin exhibited some galls from Currajong trees and the secretary, Mr. E. S. Edwards, several fossil Fenestedas and a *Spirifer aricula* from Permo-Carboniferous strata near Hobart, Tasmania.

NOTES ON A LECTURE ON DRAGONFLIES.

(By R. J. Tillyard, M.A.)

THE lecturer first proceeded to speak of popular misconceptions in regard to the Dragonfly. In Australia it is known as the "Horse-stinger" and in the United States as the "Devil's Darning Needle." When Mr. Tillyard was collecting in North Queensland, he found that the Dragonfly had a reputation bad enough to justify its extermination; he was assured that it had killed a couple of horses and one man even put down the illness of his wife to its agency. Yet it possesses no sting and is absolutely harmless to man or beast. In a small way it is the friend of man, as it destroys large quantities of mosquitoes and their larvae, in fact, it can be fed from infancy to old age on these pests. The Dragonfly, however, is not common enough to extirpate them, but certainly aids in keeping them down.

The Dragonfly belongs to the order Neuroptera or nerve-winged insects, an order to which very little attention has been directed. One is struck with the smallness of the groups in this order in comparison with some of the others such as the Coleoptera for instance; but these small groups are survivors of groups of insects which at one time existed in large numbers. At a remote period of time Dragonflies could be found over the whole world from Pole to Pole, but like all insects they were most numerous in tropical countries. In the coal measures of France fossilized remains of insects have been positively identified by an eminent French scientist as pre-historic. These existed before the advent of birds and lizards. When, in the course of evolution, Nature formed the latter, the large Dragonflies, which were insects of rather weak flight, were quickly attacked and almost exterminated. Our present-day Dragonflies have, therefore, been evolved in two directions, both of which gave them the necessary power to escape their new foes:—(1) Small weak species that fly little, and rely on concealment ("damsel flies") and (2) larger species of excessively strong and rapid flight. The perfect wings of the latter kinds were obtained by conserving the wing material and distributing it to the best advantage.

The egg-laying of the Dragonfly is different in different species, but there are two main groups. In one, the ovipositor is large, in the other it is wanting altogether. The female of the former class pierces the tissue of water plants with its ovipositor and raises up the tissue, under which it places the egg. As would be expected the egg is elongated and has a fairly sharp point at one end, which enables it to slip easily into the tissue of the plant. Sometimes the female puts her abdomen under the water, at other times both male and female will descend together, as much as three feet below the water. When seen under the water they have a silver-plated appearance, due to the envelope of air which they take down with them. When they descend, the wings are folded close to the body and reach nearly to its end, so that air is enclosed between them the whole way down. The hairs on the thorax also hold air between the head and thorax and thus the insect keeps perfectly dry. The other class lays eggs which are round in shape and are covered with sticky substance. The insect brushes its abdomen against the water while flying and washes off the eggs from it in small bundles. The sticky substance dissolves and the eggs are dispersed over the bottom of the water. No one knows how long the eggs take to hatch. The lecturer was of opinion that the time is six weeks. The eggs which he had under observation turned brown after the first week. Then two black spots appeared, these being the beady eyes of the larvae. At the end of six weeks they hatched out. They proved veritable cannibals, only ten being left out of fifty at the end of one day. Very few survive and the appetite of these is voracious. The result is that the skin soon tightens, and in common with other insects it is shed and a new one formed. How often it does this is not known. Those which the lecturer had under observation were observed to change five times; but he could not say for certain that this was the total number of changes.

Dragonfly larvae differ from all other known animals in having an enormous development of the underlip, which is in the form of a large jointed arm. In repose it covers the face, giving it a harmless and innocent expression. But as soon as its prey approaches near enough, this huge arm, furnished at its end with powerful teeth, it shot out, and the victim seized. The larva then worries it captive, shaking it from side to side until it is quiet, when it draws its underlip in and proceeds to devour its food at leisure.

We may divide the larvae roughly into two classes, mud-dwellers and stem-dwellers. Of the former there are three kinds. One kind buries itself in mud, allowing only its eyes and tail to show above water. Another kind simply sits at

the bottom of stagnant pools, depending on its muddy colouration for concealment. The third kind live in clean sand in running water, and cover themselves by throwing the sand up over them with their legs. These larvae have clubbed antennae and apparently eat very little food compared to the other kind. The stem-dwellers are of two kinds. One kind is large and elongated, with huge eyes. These differ in colour. If they live on twigs they are black; but are green when living on green stems. They are very voracious and stalk their prey, dodging behind the reeds in their efforts to catch them. The different species prey on one another to a great extent. Those which suffer most in this way, as is always the case in Nature lay the greatest quantity of eggs. The second kind of larvae in this class is a small slender insect, possessing three caudal appendages, supposed by some, to be gills. The appendages are full of veins, and are of different colours, pink, brown, green and cream. It is very doubtful if these are gills, for if they are broken off the insect does not die, and the appendage appears again at the next moult, but are smaller. The lecturer was of opinion that it is quite possible that their attractive appearance is simply a bait for its foe, so that when pursued the enemy may bite it off and permit the Dragonfly to escape. After two moults the appendages grow again to their full size.

Prior to the Dragonfly coming out of the water, when it is full-fed, it lies dormant at the bottom and becomes a dirty brown colour. It next climbs up a stem out of the water on to the herbage and waits for its final change. The fore legs, eyes and antennae are first drawn out into the thoracic space and the skin splits down the back to the wing cases. Then the insect rests for a while till the legs are dry, waves them about to find something to fix on, and finally with a great pull draws out the body, the segments of which, seem to lengthen with the pull. The growth of the wings is so rapid that it is impossible to follow it. The first half is out in about two minutes, and in ten minutes they are fully developed. The body develops to its full length in half an hour, is of a green colour and the wings are sticky. When there is plenty of sunlight the insect hides for a week or so and then comes out with its lovely colours, fully formed.

Mr. Tillyard showed a diagram of the species *Nannodysdercus australis*. He pointed out the extraordinary size of the eyes which are supposed to have many thousand facets. The neurulation of the wings is the basis for classification in the Neuroptera. The body is composed of ten complete segments, the eleventh being aborted into appendages. In the male these are used to catch the females when pairing. The lecturer showed a collection of Dragonflies to the audience at the close of his lecture.

ABSTRACT OF LECTURE ON GEOLOGY OF SYDNEY.

(By W. N. Benson, B.Sc.)

MR. BENSON likened the geological deposits of the Sydney district to a pile of saucers with Sydney at the centre and this district in Permo-Carboniferous times, the sea washed Newcastle, Lithgow, and Nowra situated near the rim. Over and icebergs deposited stones on its floor. These sea-deposits form what is called the Lower Marine Series. The sea gradually silted up and became a great marsh on which grew enormous fern forests; the land was slowly sinking and these fern forests formed the Greta coal seam. Again, the sea washed over the district, the deposits this time forming the Upper Marine Series. Once more it was silted up and again forests grew. The land slowly settled and the buried forests became the Newcastle coal measures. At this time there was great volcanic activity at Murrurundi on the North and Kiama on the south, and vast quantities of volcanic matter were ejected and washed down by streams and rivers. Then followed in Trias-Jura times the deposition of the Narrabeen shales and conglomerates, the materials probably coming from the north-west. Volcanic dust forms the chocolate shales of Narrabeen and Stanwell Park—a strata which carries a characteristic vegetation. Then followed a change of drainage and the formation of the Hawkesbury sandstone, the material for which came from the south-west. The final series was a lake deposit, the Wianamatta shales.

By means of lantern slides the lecturer showed specimens of fossil ferns—*Glossopteris* and *Thinnfeldia*—numerous shells, fish and the *Labyrinthodont*.

In Tertiary times came the uplift of the Blue Mountains and the volcanic activity which produced the dykes and necks at Hornsby, Prospect, Dundas, Bondi, and other places. The lecturer showed excellent views of the prismatic sandstone at Bondi. He referred to the sinking of the land by which Sydney Harbour was formed and the Hawkesbury River Valley inundated by the sea.

The production of sand beaches and spits and the present form of the coast-line has been the work of a recent geological period. A slight elevation of a few feet has been converted into dry land. An instance of this is Manly, where originally North Head was an island.

The lecturer was warmly applauded at the close of his most interesting lecture.

THE PRESIDENT AND MRS. FROGGATT'S
"AT HOME."

JUNE.—The members of the Naturalists' Club were invited to an "At Home," at "Bonito," Croydon, the residence of

our President, on Saturday, 4th June. Many members availed themselves of the kind invitation and enjoyed a delightful afternoon. Mr. Froggatt showed the visitors his extremely fine collection of insects and answered the many questions which his splendid specimens naturally suggested. The entomologist, like every scientist, is essentially a travelled man, he goes into more out-of-the-way places than almost any other class of man and Mr. Froggatt is no exception to the rule. He has travelled far up the Strickland River, New Guinea, where he collected many curiosities which he exhibited to his guests. These proved of great interest. Mr. Froggatt's library is full of interesting books of a scientific character, but he is a discriminating book collector with all the collector's enthusiasm and good taste, so that amongst his collection are many interesting old books on scientific subjects, some of them beautifully printed and superbly illustrated. It was a collection that greatly delighted some of the book-lovers amongst our members. Mr. Froggatt also showed his collection of photographs, gathered during his recent trip round the world. Amongst them were photographs of some of the leading scientists of the day. Mrs. Froggatt entertained the visitors at afternoon tea. Time passed only too quickly and members left late in the afternoon, delighted with the kindness and hospitality of their host and hostess.

NOTES ON EXHIBITS.

MR. W. W. FROGGATT exhibited two interesting books on natural history and submitted the following notes:—

"The Voyager's Companion or the Shell Collectors," by John Mawe, London, 1801 (price 5/-). According to his own account Mr. John Mawe was a retired sailor who set up a dealer and collector's business in London and issued several little books, chiefly to encourage people to become field naturalists; he collected all kinds of things, though shells were his hobby, and these he would buy from collectors. The frontispiece, and his description of it, is an interesting bit of colour and word painting. This book deals with all kinds of specimens, instructions for bird skinning, insects, and minerals.

The second book, "Episodes of Insect Life," was exhibited to show that nature study was not an unknown thing over 60 years ago, and for dainty get-up, and fine writing, where the making of a book was a labour of love among naturalists of the last generation while at the present time there are dozens of so-called "nature study books," that are only run out for sale.

EXCURSION.

TRIP TO DUNDAS QUARRIES.

APRIL.—There was an appearance of Autumn in the orchards which slope in gradual succession from Dundas railway station to the top of the hills some hundreds of feet high. We were some thirty in number who filed out of the station along the road to Dundas Quarries. It was an artist's afternoon as well as a naturalist's. There was every shade of colour from soft greys to deep crimsons and groves of tall green trees lent distinction to the scene. Mr. Benson, B.Sc., was the leader. He supplied each member of the party with a coloured sketch map of the Quarry together with a list of the minerals found there; these proved of great use and his thoughtful kindness was greatly appreciated. The leader drew attention to the fact that the surface of the surrounding country was composed of Wianamatta shales of varying depths. The walls of the quarry are mainly composed of breccia through which, at various points, tongues of lava had forced its way. The floor of the quarry is the main volcanic pipe and the height from the floor to the top of the excavation at its highest point about 167 feet. Mr. Benson stated that it was his opinion that it is the result of two volcanic outbursts the first having failed to force itself to the surface, the second, however, driving the strata intervening between itself and the surface upwards. The second upheaval brought the lava to the surface. More than an hour was spent in collecting specimens. These consisted of specimens of altered shale, basalt, breccia, gabbro, diallage, some excellent specimens of calcite, aragonite and chromite. Recent excavation has laid bare some good specimens of columnar basalt. The excursion proved an unqualified success. Specimens collected were as follow:—Rocks: Shale, Sandstone, Conglomerate, Breccia, Basalt, Anorthosite, Gabbro, Hartzburgite, Sherzolute, Dunite, and Serpentine. Minerals: Barytes, Aragonite, Calsite, Siderite, Quartz, Amethyst, Pyrites, and Chlorite.

PUBLICATIONS RECEIVED.

THE EMU, April, 1910.—The April number of this publication is a very fine one. There is an excellent account by F. Lawson Whitlock, on "The East Murchison," describing a four months' collecting trip. Accompanying the article is a splendid series of illustrations. There are a number of shorter articles of much interest.

The Selborne Magazine, March and April, 1910, numbers. A short article on "The Functions of an Insect's Antennae," in the March number, should be read by members. The

Taenioid Astodes of North American Birds, a publication of the Smithsonian Institution, U.S.A. This is a highly technical work, full of useful information for the advanced scientist.

The Victorian Naturalist, April and May numbers.

Memoirs of the National Museum, Melbourne, No. 3, contains two articles on "A collection of sub-fossil bird and marsupial remains from King Island, Bass Strait" and "The existing species of the genus *Phascolomys*," by Baldwin Spencer and J. A. Kershaw.

The Geelong Naturalist. March 1910. This number contains an article by our President, Mr. Froggatt, entitled, "A Naturalist's Notes in the Solomon Islands."

"Locusts in Australia and Other Countries," and "The House-Fly and the Diseases it Spreads," are the titles of two short papers by Mr. Froggatt, by whom they were donated.

Mr. D. G. Stead, presented a pamphlet, of which he was the author, entitled, "Cultivating the Snapping Turtle of Japan."

NOTES ON KIRBY'S CATALOGUE OF THE ORTHOPTERA.

(By W. W. Froggatt, F.L.S.)

THE third and last volume of W. F. Kirby's Catalogue of the Orthoptera has just come to hand from the trustees of the British Museum (Natural History), and only one who has done catalogue work can grasp the amount of labour that this veteran entomologist has put into these volumes.

This volume contains a list of the short-horned locusts or grasshoppers (Locustidae) insects, important from an economic standpoint, because all the true plague locusts of the world fall into this division. In going through this list one is struck with the fact that the locusts of Australasia have no affinities with those of the New World, none of the American genera except the cosmopolitan *Paratettix* and *Acrydium* being represented here.

There are 143 species recorded from Australia and these are distributed over 42 genera, 20 of which are peculiar to Australia whilst 16 are common to Africa, Australia, the

Malayan region and Asia; a few have spread south or east into the Pacific Islands and several have invaded Southern Europe. Eight species are credited to the genus *Apotropis*, five of which occur in Australia, the others ranging from New Guinea to Hawaii.

If one were to make a map illustrating the range of the genera of locusts found in Australia, it would be found to form a horseshoe-like band from Africa right up and around Southern Asia, turning round China, Japan, the Philippines and down these islands through New Guinea into Australia. One genus of eight species, *Trigoniza*, is confined to Australia, Tasmania and New Zealand. In the genus *Gastromargus*, our handsome yellow winged locust determined by Kirby for me as *Locusta danica*, is now defined as *Gastromargus musicus*, Fabr., and this species is peculiar to Australia. *Locusta danica* ranges over Europe, Asia, Africa and America, but does not reach Australia. In the very typical genus *Chortoicetes*, containing at least three of our most destructive plague locusts, we find eight African species one from Rodriguez Island, another from Banda, one from New Guinea, and one doubtfully from the Sandwich Islands.

In the Genus *Cyrtacanthacris* there are 75 species, most of which are large, powerful-flying insects. Four of these occur in Australia, many are found all over the mainland of Africa and Asia, but a number are confined to isolated islands in the Malay Archipelago and the Indian Ocean, New Hebrides and New Guinea.

NOTES AND COMMENTS.

PREPARING FLEAS FOR MOUNTING.—For purposes of mounting, fleas should be killed in weak spirit; a 40 per cent. solution is strong enough and they may remain in it for an indefinite period. From the spirit they should be transferred to a 10 per cent. solution of caustic potash till cleared; the time required for clearing is variable, 24 hours sufficing for some species, while others may require from three days to a week. From the caustic potash they should be placed in several changes of water. In all phases of mounting it is essential that distilled water should be used, as the aquatic organisms are very noticeable under the high-power lenses. Having been thoroughly washed, the specimen is placed in glacial (concentrated) acetic acid for 12 hours. After the acid they require as many changes of water as

will dismiss the odour of the acid, and are then placed in strong spirit. If anything should interfere with the process of mounting the specimens may be left in the spirit till it is convenient to continue the work. From the spirit they must be placed in an oil which is miscible with the substance in which the specimen is to be embedded. As the substance is usually Canada balsam, clove or cedar oils are very serviceable, the former being the most used on account of its cheapness. After the oil, the specimen should be placed in turpentine for about five minutes previous to embedding. The slides should be labelled with as many particulars as possible, the name and locality of the host being the most important.

REX W. BRETNALL.

A NOXIOUS WEED NEW TO NEW SOUTH WALES.—*Martynia fragrans*, Lindl., a Mexican plant has recently established itself in parts of the Narromine district, N.S.W. Two long incurved hooked beaks terminate the fruit and as these cling to any woolly or hairy substance, pasture animals unconsciously carry them long distances and distribute the seeds far and wide. Stockowners regard this plant as a formidable new weed pest. *M. proboscidea*, Glox., was reported from the Young district, N.S.W., a couple of years ago.

BIRTHDAY HONOURS.—Members of the Club will unite with us in congratulating Professor David, F.R.S., in having been created a C.M.G. The Professor has done magnificent work, and in the pursuit of his studies has travelled and braved dangers in tropical and Antarctic regions. In honouring such a distinguished man as Professor David, the King has honoured Australian science generally.

NEW RECORDS.—At the June meeting of the Linnean Society of New South Wales, Mr. D. G. Stead recorded, as an addition to the fish-fauna of New South Wales, a species of Serranid Perch, *Diagramma crassispinum*. Ruppell (= *D. affine*, Gunther), a fine example of which, measuring 674mm., and weighing 16½lbs., had been received by the Department of Fisheries, early in May, from Port Macquarie. He also placed on record the second known occurrence of the Pristipomatid fish, *Therapon jarbua* (Forsk.); a specimen measuring 143.5 mm., having been received from the same locality. At the same meeting Mr. A. R. McCulloch exhibited, by permission of the Curator of the Australian Museum, a small sunfish, *Ranzania makua*. Jenkins, which had been forwarded to Sydney by the Curator of the West Australian Museum. This species has hitherto been recorded from Honolulu and



Japan only, though a specimen has been in the Australian Museum for many years, which was received from Naudinus.

HYBRID SEEDLINGS.—At a meeting of the Linnean Society of New South Wales, held on Wednesday, 29th June, Dr. Cuthbert Hall, exhibited a hybrid seedling from seed gathered from a cultivated specimen of *Acacia baileyana*. It had been found that this *Acacia*, when growing near *Acacia decurrens*, gave about 20 per cent. of hybrids, which differed materially from either parent. The hybridisation may probably have been effected by bees, both specimens flowering at the same time.

DEAD ANTS.—At the same meeting as above Mr. T. Steel exhibited a quantity of the dead bodies of an ant *Iridomyrmex nitidus*, Mayr, from Herbert River, Queensland, found in March, 1908, in numerous little heaps scattered over the surface of the ground. The heaps varied from a few dozen bodies to many thousands. The ants were busy bringing the bodies and placing them on the heaps. Could this mortality have been due to an epidemic of some sort? Microscopically the ants exhibit no injury or give any indication of the cause of death.

DROUGHT-RESISTING ODONATE LARVA.—Mr. Tillyard exhibited at the April meeting of the Linnean Society of New South Wales, a larva of *Synthemis eustalaeta*, Burm., (Neuroptera: Odonata) which had been without food for three months, and had been subjected to gradual drought conditions culminating in three weeks of complete absence of water. The insect was still alive and quite healthy. Three others, though apparently lifeless when first examined, quickly revived when dropped into water. This seemed to be the first absolute proof of the ability of any dragonfly larva to stand a complete drought.

RECENT APPOINTMENTS.—Among recent appointments two of our members figure prominently—Dr. E. J. Goddard, Linnean Macleay Fellow, and Mr. W. W. Froggatt. Of these two gentlemen, E. J. Goddard, B.A., D.Sc., has been appointed to the position of Professor of Biology and Geology at Victoria College, Stellenbosch, South Africa, and W. W. Froggatt, F.L.S., as Lecturer on Economic Entomology at the Sydney University. Professor Goddard, who had had a brilliant university career in Sydney, has already entered upon his duties, but Mr. Froggatt, Government Entomologist, who was recommended to his new position by the recently-appointed Professor of Agriculture, will commence work in his new sphere as from January 1st, 1911. Mr. Froggatt's appointment is subject to the approval of the Government.

OBITUARY.—It is with deep regret that we have to record the death of Mrs. C. Coles, wife of one of our members. The deceased lady passed away at the early age of 29, after an exceedingly painful illness. Mrs. Coles was well-known to most of our members, with whom she was most deservedly popular, and to whom she had greatly endeared herself by her bright and cheerful disposition. Our sympathy, and that of the Club, is most heartily extended to Mr. Coles and his bereaved children. Amongst men of science, we have to announce the demise of Mr. G. W. Kirkaldy, a well-known Hemipterist, and a member of the entomological staff of the Hawaiian Sugar Planters' Association. Mr. Kirkaldy was only 37 years of age, but into his brief life he had crowded an immensity of work. Mr. Kirkaldy's death was due to an accident. Shortly after his arrival in Honolulu, while out riding, he forgot the American rule of the road, and turned his horse, after the English fashion, to the left as he came to a turn in the road, and crashed into a carriage coming in the opposite direction. His horse fell on him and crushed his leg. The injured limb was badly set, and after the bones had knit, had to be broken again and reset. This operation was repeated no less than four times. At the close of last year he went to San Francisco to spend the Christmas holidays with his wife and child, and whilst there was induced to submit to a fifth operation. This, although successful, proved too much for him; he grew gradually weaker and weaker, expiring on the 2nd of February. At the time of his death Mr. Kirkaldy was engaged upon the publication of an important and extensive work, "Catalogue of the Hemiptera (Heteroptera)," of which vol. 1, dealing with the Cimicidae was published last year; vol. 2, to contain the Thyreocoridae, Urolabididae, Aradidae, and Coreidae, is now in the press, whilst a third volume was reported as being in active preparation. Science can ill afford to lose such workers.

NEW BUTTERFLY RECORDS.—In March of the present year, Mr. H. Wyld had the good fortune to secure two new records for New South Wales, at Billinudgel near Byron Bay. These are *Mynes guerini*, Wallace, and *Pseudodipsas digglesii*, Hew., female specimens being captured in both cases. Both these species have been taken near Brisbane. Mr. D. G. Stead has given me a male specimen of *Delias argenthona*, Fab., taken at Walgett on the 16th May this year, where it was not uncommon. He also noticed the same striking species between the Wirrabilla Lagoon and the Barwon. This shows this species to be an inland as well as a coastal form, and suggests that its presence in northern West Australia is due to distribution across the continent rather than along the coast.—G. A. WATERHOUSE.

THE
Australian Naturalist.

VOL. II.

OCTOBER 4, 1910.

PART 4.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

MINUTES.—Meeting held June, 1910.

NOMINATIONS.—Mr. G. R. Horan, Miss Rothwell, Mr. T. McCarthy.

LECTURE.—Mr. G. H. Smith, F.C.S., gave an interesting lecture on the "Chemical Products of some Australian Plants."

EXHIBITS.—Mr. Cheel exhibited some most interesting botanical specimens. Mr. Froggatt, a necklace made from cases of scale coccids brought to the surface by ants. Master Oliver Edwards, pupa of Cup Moth.

MINUTES.—Ordinary meeting held in Board Room, 82 Pitt-street, on Thursday, 7th July, 8 p.m., Mr. W. W. Froggatt, F.L.S., in the chair.

ELECTIONS.—Mr. G. R. Horan, Miss Rothwell, Mr. T. McCarthy.

NOMINATIONS.—Dr. J. C. Cox, Mr. Harry Currie.

EXHIBITS.—Mr. Froggatt—A Gecko. Mr. Cheel—Botanical Specimens. Mr. Hamblin—A collection of insects secured in the neighbourhood of Sydney. Mr. E. S. Edwards—Fossil Goniatites from marine beds, West Maitland.

LECTURE.—By Mr. le Souef (Director of Melbourne Zoo) on "Zoology," illustrated by the camera.

ANNUAL MEETING.—The annual meeting was held on August 24th, 1910, the President (Mr. W. W. Froggatt, F.L.S.), in the chair, when the annual report of the Council and the Hon. Treasurer's balance-sheet were read and adopted. The retiring President delivered an address entitled: "Insects in Relation to Disease," which he illustrated with a series of beautiful lantern slides.

ORDINARY MEETING.—The ordinary monthly meeting was held at the Royal Society's house, Elizabeth-street, Tuesday, 6th September, at 8 p.m.

ELECTIONS.—Dr. J. C. Cox, Mr. Harrie Currie.

NOMINATIONS.—Mr. H. C. L. Anderson, M.A., Mr. Kemp, Mr. J. H. Maiden, F.L.S., Master Willson (Ballina), Master Musgrave.

LECTURE.—By Mr. G. A. Waterhouse, B.Sc., on "Ten Days With the Winter Butterflies of North Queensland."

EXHIBITS.—Meeting 6th, September, 1910. Mr. Edwin Cheel (Botanical Assistant) exhibited on behalf of Mr. J. H. Maiden (Director Botanic Gardens, Sydney), the following interesting plants, collected during Mr. Maiden's journey in Western Australia in September—December, 1909:—

Hæmodoraceæ.—*Conostylis aurea*, Lindl, from Welshpool; *Anigozanthos Rufa*, Labill, from Parongorups; *Anigozanthos Viridis*, Endl, from Cannington; *Anigozanthos Manglesii*, Don, from Welshpool; *Macropidia Fumosa*, Drumm, from Mogumber. [This is known as the Black Kangaroo-paw.]

Amarantaceæ.—*Trichinium Manglesii*, Lindl, from Cannington; *Trichinium Helipteroides*, from Taverton.

The following sea-weeds were also exhibited, which were collected at Balmoral Beach during the excursion on August 7th, 1910:—

Phyllospora Comosa, Ag., *Ecklonia radiata* var *exasperata*, *Hormosira Banksii*, Dick, *Gymnosorus nigrescens*, Ag., *Gelidium dapillaceum* (?), *Corallina* sp., *Sargassum* sp.

NEW SOUTH WALES NATURALISTS' CLUB.

TENTH ANNUAL REPORT.

(Read at the Annual Meeting, held in the Royal Society's Hall, Elizabeth-street, August 24th, 1910.)

The Council has much pleasure in presenting the tenth annual report to the Naturalists' Club. The year has proved one of steady work and satisfactory progress. Ten ordinary meetings and one special meeting have been held during the year at which the following lectures were delivered:—"The Insects of the Solomon Islands," by W. W. Froggatt, F.L.S.; "The Distribution of the Fauna of Queensland," by Archibald Meston, F.R.G.S.; "Australian Pines," R. T. Baker, F.L.S.; "Australian Grasshoppers and Stick Insects," W. B. Gurney, F.E.S.; "Notes on Zoo Work," A. S. le Souef; "Botany in Relation to Geology and Physiography," R. H. Cambage, L.S.; "Geology of Sydney" W. N. Benson, B.Sc.; "Dragon Flies," R. J. Tillyard, M.A.; "Chemical Products of some Australian Plants," G. H. Smith, F.C.S. "Zoology With the Aid of the Camera," D. le Souef (Melbourne).

Many scientific exhibits of great interest have been shown at our meetings and have resulted in interesting discussions. The monthly excursions have been remarkably well-attended and have been most ably led. Our thanks are due to Mr. Hedley, F.L.S., Mr. A. R. McCulloch, B.Sc., Mr. W. N. Benson, B.Sc., Mr. S. J. Johnston, B.Sc., Mr. Cheel F.L.S., and Mr. D. G. Stead, for leading our excursions. Two of our outings had to be abandoned on account of inclement weather.

The library is steadily increasing in size and many new publications have been added to it during the year.

As will be seen by the Treasurer's statement, the finances of the Club are in a sound condition, the balance to the Club's credit being £64 9s. 1d.

The Council of the Club at its last annual meeting decided to try and obtain more suitable rooms for the Club meetings and are glad to be able to inform the members that they have secured the hall of the Royal Society's House at a slightly increased cost over that incurred in renting the rooms previously occupied by us. This, however, has necessitated the alteration of the night of meeting from the first Thursday to the first Tuesday in each month.

During the year Mr. Lancelot Harrison was compelled, through pressure of work, to resign his position as Secretary of the Club and his resignation was accepted with much regret.

W. W. FROGGATT, President.

E. S. EDWARDS, Hon. Secretary.

"INSECTS IN RELATION TO DISEASE."

(Abstract of Presidential Address, delivered on the 24th August,
by Walter W. Froggatt, F.L.S.)

THE importance of the branch of Economic Entomology, dealing with the investigations carried out in the tropical schools of medicine, both in their laboratories and exploring expeditions was first explained, and the establishment of the Tropical Schools at Liverpool, London, Paris and other parts of the world described. The value of the combined work of the trained entomologist in the identification of species of insects that act as intermediate hosts of the micro organisms causing tropical diseases, their range, and their histories, and the investigations of the biologist and the doctor taken together have altered the conditions of life for the white man in tropical fever-stricken countries.

The tropical zone forms a band round the earth about 1400 miles in width, containing some of the richest and most valuable land in the world, which, until the last few years, has only been occupied by the white man at a great sacrifice of life and physical and moral deterioration, for the white woman could not live in many parts of the tropics so he inter-married with the native and an inferior half-breed race resulted.

This state of things was due simply to the presence of the mosquito. Destroy the mosquito and no matter how damp, wet and undrained the plains, how dense the forest and jungle. Malarial fevers do not exist without these insects. The map of the world has even been altered by the biting flies; history records that the Portuguese expeditions from the east coast of Africa in the sixteenth century were forced back to the coastal settlements by the attacks of the Tsetse Flies killing all their horses and cattle when they attempted to penetrate into the interior.

Drinking stagnant water containing decaying vegetable matter was said to give one fever. That if one slept on the ground in the tropical scrubs, the rising mists (miasma) would give one fever. The opening up and ploughing of new land for plantations were also looked upon as one of the causes of fever appearing. Only a few years ago these were the popular ideas on malarial fevers.

It was never suspected that the mosquitoes had anything to do with malarial fevers that attacked man in all the tropical jungles.

Thus miasma was the terror of the tropics. Boyce in his "Mosquito or Man" says: "It is almost impossible to realise to-day, the incubus which this nightmare has been upon the world's progress. In the old days the young man, be he soldier, sailor, or young merchant, went to what was known as 'the white man's grave.' Amongst the British garrisons 69 per cent. was not an uncommon mortality rate."

Nearer home in the sugar lands of North Queensland and the forests of New Guinea, every white man who remained any time suffered more or less from malarial fevers and none of the modern precautions were taken against mosquitoes. Up to twenty years ago fever was one of the things that had to be put up with in the tropics. Yet, in 1848, Dr. Nott, of Mobile Alabama, U.S.A., published his opinion that yellow fever might be caused by mosquitoes, and in 1853 Dr. Lewis Danial Beauprethuy, who had spent the best years of his life studying the causes of yellow fever in South America and the West Indies, positively stated that the mosquito was the primary cause of yellow fever. This was the first light thrown upon the subject, but Beauprethuy's work was almost forgotten when King in 1883 published his book, "Mosquito and Malaria," in New York. In 1881, Finlay had brought fresh evidence to prove that not only was yellow fever caused by mosquitoes but identified the yellow fever mosquito, which we now know as *Stegomyia calopus*.

About 1883, Dr. Manson showed that certain species of female mosquitoes were the intermediate host of the blood parasite (*Filaria*), which, entering the human blood, multiplies and produces malarial fever. This *Filaria* is a "microscopic animalcule, eel-shaped and enclosed in a loose sac in which it wriggles about in the blood most actively." The larval form had been discovered, as far back as 1863 in the blood of natives in India by Demarquay, and by Lewis in 1872.

Later on by the examination of the blood of thousands of natives of China and Amoy Dr. (now Sir Patrick) Manson, found the actual parasite that was the cause of malarial fever, and the labours of Major Ross in India, explained the manner in which this blood parasite was introduced into the blood of man by the mosquito.

Briefly stated, certain genera of mosquitoes are infested with this blood parasite which the mosquito sucks up when biting a person infected with fever. These *filaria* develop in the body of the mosquito, then make their way down into the salivary glands from whence they flow into the human blood with the fluid injected by the proboscis of the biting mosquito.

When in the human blood these parasites multiply with such wonderful rapidity that within from four to ten days a man will show the first signs of malarial fever. So small are some of these protozoa that the one causing yellow fever has not yet been seen with the highest microscopic power.

These discoveries have caused an immense amount of work to be devoted to the collection, study and classification of mosquitoes all over the world. Theobald has catalogued all the known species in a monograph of the "*Culicidae*" comprising five large volumes, published by the trustees of the British Museum and we now have a good idea of the harmless and dangerous species and where they breed and develop. It is the information gained by the work of entomologists that has enabled the authorities dealing with the sanitary conditions of infested areas to fight the fever mosquitoes, and through their destruction banish or greatly reduce the ravages of yellow and other malarial fevers.

There are many examples of this in the work carried out by the United States sanitary officers in New Orleans where, in the earlier outbreaks of the yellow fever epidemics in 1853, with a population of 130,000, New Orleans lost 8,000; in 1858 over 5000 perished, and in 1878 there were 4000 died. Under present conditions, where all water tanks are covered and all stagnant water treated with oil, or drained away, yellow fever as an epidemic is a thing of the past. The same

methods have been adopted under a Sanitary Commission in Havana, the beautiful capital of Cuba, and in the Panama Canal, where during the French occupation over 50,000 persons are said to have died, yellow fever has been stamped out and malarial fever is well in hand. All this has come about in a few years, the workmen on the Canal live and sleep in mosquito-proof houses, and all breeding places of the mosquitoes filled in, covered, or oiled.

In the Roman Compagna, Ismalia in Egypt, and the Federated Malay States similar work has been successfully carried out, and with the mosquito the fevers have vanished or been greatly reduced.

In Australia little or no attention has been paid to destroying or treating the breeding places of local mosquitoes but with the knowledge that a single tub or house bucket in the back yard in which stagnant water has been allowed to remain for a week, will breed enough mosquitoes to render life outside a mosquito net miserable, we may expect that every householder will look after all receptacles that may breed these blood-sucking pests.

We now come to another important group of biting, or rather blood-sucking flies; everyone who has read works on "African Travels" will recall the damage to flocks and herds by the Tsetse Fly which attacks horses and cattle, and in biting them infects the blood with a somewhat similar blood parasite (*Trypanosoma brucei*), causing a deadly disease called "Nanguna." This fly allied to our March flies was described by Westwood in 1850, under the name of *Glossina morsitans*.

In 1902, Dr. Dutton of the Liverpool Tropical School of Medicine, while studying tropical fevers in the African colony of Gambia, discovered a similar parasite in the blood of a native which he called "*Trypanosoma gambiense*." "In the same year," Boyce says, "the world was made aware by Bruce and Castellane of the fact that the mysterious and deadly disease which was rapidly spreading in Central Africa—'Sleeping Sickness'—was due to the same parasite. After careful investigation it was discovered that this deadly disease was transmitted to man by the bite of another 'Tsetse Fly' described many years before under the name of *Glossina nobilis*. This fly was abundant along the edges of the swamps and marshes and the shores of the great lakes, and as the infected natives came out from the Congo forests along the new trade routes to Uganda, the flies became infected from these negroes, and within the last few years the whole population has been swept off the land as if by a plague, and it is estimated that over 200,000 natives have died in Uganda

alone without counting the thousands in the Congo Free State and other localities. Sleeping Sickness is now known to extend over a million square miles in Central Africa.

According to authorities like Koch and Manson, arsenic in the form of atoxyl is as efficacious in the early stages of sleeping sickness, as quinine is in malaria. Removal of the natives from the low-lying marsh land, and the destruction of the cover among which the flies shelter are the methods adopted.

The next, and perhaps, one of the most serious pests to man, is the common House Fly (*Musca domestica*) and thousands of deaths are caused every year through the presence of this fly in our streets and houses. This fly lays her eggs in fresh horse droppings and decaying vegetable matter. On such material the maggots feed, develop and pupate and bring forth a fresh crop of flies. The house fly lives on filth and then covered with filth-germs of all kinds flies into the house, settles upon our food and tumbles into the milk. It is one of the most active agents in the spread of typhoid fever, tuberculosis, Asiatic cholera, dysentery and other intestinal diseases.

This has been so strongly demonstrated in the United States that Dr. Howard proposes to drop the harmless sounding name of "house fly" and called it the "Typhoid fly."

Under proper sanitary conditions there should be no filth or stable manure allowed to accumulate in the streets or back-yards of any town; if all matter in which flies can lay their eggs is destroyed or covered over and removed there will be no fly pest. Another group of insects closely related to the flies are the fleas, though very unlike them in general appearance. House fleas are the best known, they deposit their eggs in dusty places where the slender white larvae live and finally pupate in tubular silken cocoons. Next comes the common dog flea, many birds as well as wild animals, among them our marsupials, have their own peculiar flea. Shipley (Journal of Economic Biology, 1908), gives a lot of fifteen distinct species of fleas that have been obtained from the fur of the two common cosmopolitan rats, the House Rat (*Mus rattus*) and the Black Rat (*Mus decumanus*) and it is with the fleas infesting these little animals that the entomologist and biologist has had to deal in studying the transmission of disease germs to man.

During the outbreaks of plague in India it was proved that one of the common rat fleas (*Pulex cheopis*) was capable of transmitting the germs of plague from plague-stricken rats to man. And in Australia the bubonic plague was spread in Sydney, thus when the diseased rats are swarming in the sewers

and houses the fleas that infest them are as deadly as a black snake. With the knowledge thus gained thousands of pounds have been spent in Sydney in making rat-proof floors, and the construction of wharves in which rats cannot take shelter, for without rats there are no rat fleas.

Fleas are also strongly suspected of spreading that living death—leprosy—in the same manner, and this would account for the rapid and mysterious way in which this disease has spread in such countries as Hawaii, where at the Lazaretto at Molokai Island there are some 1400 lepers, including all ranks and races, men, women and children. The South American Jigger is another flea that has the unpleasant habit of burrowing under toe nails of the natives, where the female flea rapidly increases in size, she lays her eggs and produces ulcers that often incapacitate the natives from walking. This flea has been accidentally introduced into tropical Africa, and quite recently an exploring expedition had to make a halt, as all the carriers were suffering from "jiggers."

Though not true insects the Ticks should be noticed and while not going into the question of the great losses caused by the disease—Redwater—transmitted to cattle by the Queensland Cattle Tick, we find others that produce similar diseases in man.

Drs. Dutton and Todd showed that the blood parasite *Spirillum* of relapsing fever of Africa was transmitted from man to man by the bite of the African tick (*Ornithodoros moubata*.) Not only does this tick while sucking the blood of a fever-stricken man become infected but it passes the parasite on to its eggs and larvae, so that the next generation of ticks are virulent and capable of reproducing relapsing fever without further contact with fever-stricken man.

Spirillum fever, the spotted fever of the Rocky Mountains, Karapath disease of the Zambesi, and the fever in Persia and Beluchistan are all caused by micro-organisms transmitted by ticks.

Many brave, earnest workers have laid down their lives in carrying out the investigations that have thrown so much light on the mysterious tropical diseases, and through finding the cause, have enabled the authorities to take measures that have checked yellow fever, malarial fevers, plague, and sleeping sickness, saving the lives of countless thousands. All honour to the heroes of science like Dr. Dutton of the Liverpool Tropical School of Medicine, who contracted relapsing fever in Africa while working at this disease, Dr. Walter Myers who contracted yellow fever and died at Para, Lazear, who died during the same investigations, Young Manson accidentally killed in one of the Liverpool Tropical School Expeditions and a host of other well-known men.

EXCURSION TO BONDI.

THE excursion to Bondi on Saturday, September 3rd, was under the leadership of Dr. I. H. Jensen and the party proceeded from the Bondi tram terminus direct to the spot where occurs the interesting mass of columnar sandstone. The proximity of an intrusive mass of basalt, to the heat and pressure of which the columnar structure is supposed to be due, was pointed out. Dr. Jensen gave an interesting general account of the geology of the district, explaining how the beds of shale which are found intercalated with the Hawkesbury sandstone, owe their origin to past sinking of the land whereby shallow lagoons were formed in which the shale material was deposited and how a series of successive risings and fallings had brought the strata to the positions in which they are now found.

Incidentally the leader pointed out the interesting sandhill which is gradually encroaching on the land lying between Bondi and Rose Bay, and which is fed by sand blown over from the ocean beach.

Attention was also directed to the great Notonectian (south-flowing) current which is well-marked by the trend of the muddy water entering the ocean from the main sewer at Bondi point. The party descended by the track leading from the quarry, where the columnar sandstone was formerly worked for road-metal, over the cliff to the outfall of the sewer. A thick bed of shale is here exposed in section and numerous minor dykes are to be seen cutting the disturbed strata in various directions.

Following the line of cliffs in a southerly direction several gaps leading down to the water were explained as being the spaces formerly occupied by basalt dykes, which, being less durable than the sandstone, had been completely weathered out. One long dyke runs for a considerable distance in the same direction as the coast line near the edge of the cliff and having been much-weathered presents the appearance of a deep, wide, straight-sided furrow.

A visit was paid to the flat surface of the cliff just to the north of Bondi Bay where some rude outlines of fish, made by the aborigines, were seen. The leader also remarked that it had been pointed out by Mr. G. A. Waterhouse that the dykes occurring along the coast in this district, when traced outwards are found to come to a focus at one or other of two points in the ocean, the principal one of which has been proved by the "Challenger" and other soundings to be a submerged peak, probably a centre of extinct

volcanic energy to which the dykes are due. This peak, situated some 46 miles south-east of Bondi, is about 960 fathoms under water and stands on an ocean floor at a depth of about 1100 fathoms. It has been named Mount Woolnough by Mr. Hedley. The excursion was most enjoyable and instructive and Dr. Jensen's intimate knowledge of the geological features of the district was freely placed at the disposal of the members and friends.

T.S.

EXCURSION TO BOTANY.

SATURDAY, 6TH AUGUST.

About fifty members and friends followed Mr. S. J. Johnston, B.Sc., the leader of the botanical excursion on Saturday, 6th August. The members caught the two o'clock tram for the Botany terminus and spent the afternoon collecting. The ordinary spring flowers were not numerous but there were more than sufficient for our plant hunters for one short afternoon. Mr. Johnston's billy proved a great success and the afternoon proved not only a scientific success but a social one also.

DUNDAS QUARRIES.

Mr. Benson is about to publish a monograph on the geology of the Dundas Dyke and we look forward to the perusal of it with the greatest pleasure. In the account of the excursion to Dundas Quarry in our last issue we should have stated that Mr. Benson is of opinion that both volcanic outbursts reached the surface.

NOTES AND COMMENTS.

ENTOMOLOGY IN SOUTH AFRICA.—The outlook from an entomological standpoint in South Africa has undergone a great change since President Kruger's time. During the regime of this interesting old bigot, entomological research fared badly, for he refused to aid in the destruction of predatory locusts on the ground that those insects had been sent by the Deity as a punishment for the sins of the land! To-day there are several State entomologists in Cape Colony and the Transvaal, and they are doing work of the highest economic value.

SOME RECENT LITERATURE.—Part I. of vol. xxxv. of "The Proceedings of the Linnean Society of New South Wales,"

contains matter of interest to Australian naturalists. Professor Goddard, in continuation of his researches, contributes two papers, parts v. and vi., of his "Contribution to a Knowledge of Australian *Hirudinea*." Of these, the former deals with "Leech Metamerism," and is illustrated by a plate whilst the latter treats upon "The Distribution of the *Hirudinea*, with Special Reference to Australian Forms, and Remarks on their Affinities, together with Reflections of Zoogeography." "Revision of *Sympetes* and *Heloeus*, with Descriptions of new Species of *Tenebrionidae* [Coleoptera]" is the title of a paper by Mr. H. J. Carter, B.A., F.E.S., and this essay is illustrated by a number of diagrams in the text. The paper by Mr. E. Meyrick, B.A., F.R.S., entitled, "Revision of Australian *Tortricina*" is a lengthy contribution, and contains comments upon previously described species, together with descriptions of many new forms. This is a very extensive section of the group known to entomologists as Micro-Lepidoptera. Popularly, they are sometimes referred to as "Leaf-twisters" or "Leaf-rollers," and again as "Bell Moths," the latter name has reference to the bellshaped appearance of these insects when resting.

Not the least interesting paper in this part is the Presidential Address by Mr. C. Hedley, F.L.S., which deals in an extremely lucid and instructive manner with the great submarine slope of New South Wales.

STICKLEBACKS.

Amongst recent additions to his aquarium, Mr. Finckh has recently succeeded in importing the European stickleback *Gasterosteus pungitius*, this being the first record of the introduction of this interesting little fish to Australia. Out of 500 which were placed in a ship's bath and freely supplied with ice during the tropical passage, 35 survived. On their arrival the fish were extremely thin, but have fed freely and quite recovered their normal condition. Coming after numerous failures this success is most gratifying.

Other notable importations by Mr. Finckh are living specimens of the Bitterling *Rhodeus amarus*; a remarkable fish which requires the services of the fresh water Mussel (*Unio*) as a host for its eggs and young; also the newts *Molge punctatus* and *M. cristatus* and the elegant water snail *Planorbis corneus*. All these are now in a healthy state and apparently quite at home in their new habitat.

N.S.W. NATURALISTS' CLUB.

Statement of Receipts and Disbursements for the year ending
July 31st, 1910.

RECEIPTS.			
August 1st, 1909.			
To Balance from last year, Savings Bank	...	59 16 8	
Hon. Treasurer	1 19 11	
			61 16 7
Subscription, Current Year	32 0 0	
" in Advance	10 0	
" in Arrears (paid)	6 7 6	
			38 17 0
Sale of Journals	1 12 5	
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DISBURSEMENTS.			
By Rent of Meeting Room		6 17 6
Printing Journals, 4 parts		24 5 0
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Net Outings		1 1 0
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Postages	4 15 0	
Stationary	7 0	
Notices Advertising of Meetings	4 2 3	
Carbons	7 6	
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Balance, Savings Bank	61 17 11	
In Hands Hon. Treasurer	3 1 5	
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			£108 7 9

Examined and found Correct,

A. S. LE SOUEF } Hon. Auditors.
EDWIN CHEEL }

H. E. FINCKH, Hon. Treasurer.

August 16th, 1910.

THE
Australian Naturalist.

VOL. II.

FEBRUARY 7, 1911.

PART 5.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The ordinary meeting of the Club was held at the Royal Society's House, on Thursday, October 6, 1910, the President, Mr. W. B. Gurney, F.E.S., in the chair.

ELECTION.—The following new members were elected:—Messrs. Kēmp, H. C. L. Anderson, M.A.; J. H. Maiden, F.L.S.; and Masters Willson and Musgrave.

NOMINATION.—Mr. F. C. Baker was nominated for membership.

BUSINESS.—A series of addresses on "Wattles" were contributed as follows:—Mr. W. W. Froggatt, F.L.S., "On Insects which Infest Wattles;" Mr. G. A. Waterhouse, B.Sc., on the "Butterflies of the Wattles;" Mr. Cheel, "On the Botany of the Wattles."

COTTAGE AT CRONULLA.—Miss Rothwell, on behalf of Mrs. Bayliss, offered use of a cottage at Cronulla, free, for the Club week-end excursion. The offer was gratefully accepted.

ORDINARY MEETING.—The ordinary meeting of the Club was held on Tuesday, November 1st, 1910, the President, Mr. W. B. Gurney, F.E.S., in the chair.

CORRESPONDENCE.—A letter was read from the Hon. Secretary of Association for the Advancement of Science, asking the Club to nominate a delegate to the forthcoming congress, and the President was unanimously elected to the position.

NOMINATIONS.—The following gentlemen were nominated for membership:—Messrs. Wickham, E. Larcombe, and E. S. Green.

NEW MEMBER.—Mr. F. C. Baker was unanimously elected.

REPORT.—The President reported that the two days' excursion to Cronulla had proved a great success. Between 20 and 30 members attended. Messrs. Garland and Gurney led the botanical and entomological sections respectively. A very hearty vote of thanks was accorded to Mrs. Bayliss for the use of the cottage.

LECTURE.—Mr. Cheel delivered a lecture on "Fungi," illustrated with lantern views; a number of interesting specimens in illustration of the lecture were also displayed.

EXHIBITS.—Mr. Vogan, F.R.G.S., exhibited some most interesting specimens gathered in Northern Queensland; Master Oliver Edwards, exhibited beetles gathered at Cronulla.

ORDINARY MEETING.—The ordinary meeting of the Club was held on Tuesday, December 6th, 1910, the President, Mr. W. B. Gurney, F.E.S., in the chair.

NEW MEMBERS.—The following new members were unanimously elected:—Messrs. Wickham E. Larcombe, and E. S. Green.

NOMINATIONS.—Miss Harper and Miss Susie Harper, proposed by Professor Wilson, and seconded by Mr. Stead; Mr. Lichter, proposed by Mr. Stead, seconded by Mr. Finckh.

LECTURE.—Mr. L. Harrison delivered a lecture, illustrated by lantern views, entitled: "A Trip to the Capricorn Group," at the close of which he received a hearty vote of thanks.

EXHIBITS.—Mr. Horan exhibited some beautifully-mounted birds' nests; Miss Cowle, moths; Master Edwards, wasp's nest, *Polistes tasmaniensis*, also beetles and butterflies. The exhibits of Messrs. Cheel and Froggatt were also extremely interesting.

NOTES ON ANTS: FORMICIDÆ.

THE following interesting letter has been received by Mr. W. W. Froggatt, F.L.S., from Dr. A. Forel, of Yverne, Switzerland, who has done so much work on Australian ants. The paper noted has just been published:—

"Dear Sir,—I am now going to undertake the work of publishing descriptions of all the ants that I have received from Mr. Roland E. Turner and yourself, and I make the following remarks upon the Australian genera of the *Formicidæ*.

You have in Australia a very curious genus, *Sphinctomyrmex*, Mayr. of which there are six well defined species without counting the varieties. Neither the male or female are known, and it would be extremely interesting to find them. Andre believes that the ones described are the worker's eyes (see *S. hednigæ*). Which are the females? *Ponera edwardsi*, Forel, from Africa, ordinarily has one female, with two kinds of workers, one with and one without eyes. But only patient research in the nests of these ants will discover the male and the true female.

In the Genus *Myrmecia* (Bulldog Ants) through the favour of your last sending and some from Michaelson, of which I have sent you the descriptions two years ago from South Australia, I have decided to separate some species from the whole genus, they are so complicated in spite of the size of the species. I have completely failed to obtain specimens of *Myr-*

meia from Tasmania. In the group *M. forficata*, *M. sanguinea*, *M. tricolor*, are still very confused, and there are certainly still some fine species to be yet discovered. h

Trachis Australia is very rich in fine species of the genus *Polyrachis*, but very little is known about their nests. The nests of ~~*Petrachis*~~ (from other countries) are formed by the aid of the larvae with a silky or papery substance under leaves of trees. There would be these interesting observations to make, and still many more new species to find.

The *Podomyrma*, *Ectatomma* and *Rhytidoponera* are wonderfully rich in local species, and I am sure there are still many more species to be found.

Several species of *Iridomyrmex* of which there have only been found a few females with a long flat head, as *I. anguliceps*, Forel, and *I. froggatti*, Forel, living in cavities of plants, trunks of trees, or natural cavities under the bark of trees, and these all specially adapted as the analagous forms of *Azteca*. It would be extremely interesting to break out the dry trunks, or to look in the living plants in the trunk or hollows or in the spines of Acacias or other kind of plant hollows. I am sure that one would find curious special adaptations as one finds so many in America.

There also you will find *Camponotus* with a truncate head (*Colobopsis*) among which the large headed soldiers act as doorkeepers or guards at the entrance of the nest. They are known from Australia, but their nests have never been found.

It would be interesting to pay attention to the species of ants that are parasitic on the hosts of other species. In your No. 182 from Howlong, you have collected *Meranoplus oceanicus*, Sm. but with these workers was one female and some males much smaller and certainly one species parasitic (on *M. oceanicus*?) which I have named *hospes*, n. sp. It would be interesting to refind it, and at the same time find the true male and female of *M. oceanicus*.

In drawing attention to the finding of the ant hills one has the chance of meeting with the host species and the parasite species. One discovers this much more in Europe, Asia, America and Africa than Australia.

The male and female of *Oerapachys* (*Phyracaces*) would be also interesting to find. I am sure that in searching one would still find many species of *Strumigenys* and *Solenopsis*, the first in rotten wood, or in sifting it, the second in the walls of the nests of the big ants.

The genus *Melophorus* is exclusively Antartic and Australian. It is extremely interesting and rich in Australian species; one can only find it in New Zealand and Chili. There are still many interesting things to discover.

The Australian *Acantholepis*, subgenus *Stegmacris* are also most interesting. The same of *Notoncus* and *Turneria*. Briefly, I am always most enthusiastic in Australian ant fauna, which, in my opinion, is the most beautiful in the world, and if I were younger and had more money I would have longed to go to study myself, but at 62 it is too late.

P.S.—I forgot still the interminable species *Camponotus*. It is important to take the two kinds of workers, major and minor. Often the major workers are hidden at the bottom of the nest and one only collects them as, example, *C. exx* of M. Turner.

Mr. Field has discovered a regular Eldorado of Formicidae at Tennant's Creek, a new *Camponotus fieldellus*, extremely curious with the head, and the forehead crooked, head enormous, of which the major and minor worker are entirely different from the other.

One finds *Camponotus* above all under stones, in the ground, but also in the trunks of trees. There are certainly a great number of species still to be discovered. Mr. Michaelson has found an enormous one in Western Australia, *C. molottus*.

Excuse this long letter and believe me,

Yours very truly, A. FOREL.

WITH THE WINTER BUTTERFLIES OF NORTH QUEENSLAND.

(By G. A. Waterhouse, B.Sc., F.E.S.)

THE Mecca, towards which the southern entomologist in Australia looks, is the rich tropical scrub of the Cairns district in North Queensland. Since the day our friend, Mr. G. Masters, showed me in the Macleay Museum the beautiful butterflies from this region, it had been one of my great wishes to visit this portion of our continent and make observations on the butterflies in their own home. The actual possession of the different species in my cabinets did not lessen this desire, for every true naturalist deems it of great importance to observe the forms he studies in their natural haunts, to watch their flight, to discover their early stages and not depend entirely on cabinet specimens, however beautiful they may be.

When on the 2nd July last, I went on board the s.s. Bombala, I felt that after several years' waiting my wish was at last likely to be realised. Though the time chosen was more with a view to spending a pleasant holiday without the heat of a tropical summer, still I knew that even a tropical winter produced some fine butterflies. My trip throughout was marked with fine weather, smooth seas, pleasant travelling companions and kind friends at every stage.

The first tropical port I touched at was Townsville, which did not belie its reputation for heat and dust. Here on two different days I had three or four hour's collecting, and had my first opportunity of observing the pretty blue *Junonia albicincta* alive. This species was flying about the dusty roads and settling with wings open right amongst the dust. The female of *Hypolimnas misippus* was also caught flying along the street. *Euploea corinna* was very plentiful and so also was *Hypolimnas bolina*, and in the gardens I caught several *Melanitis leda* and *Terias hecabe*. Here, too, I made my first acquaintance with live specimens of *Erynnis mathias* and the species listed as *Erynnis palmarum*, and also caught a single specimen of the diminutive *Zizera gaika*.

An hour on Magnetic Island yielded *Delias argenthona*, *Eurycus cressida*, and *Candalides erinus*.

Cairns was the next point visited, but my objective was the village of Kuranda, situated about eight miles in a direct line from Cairns at an altitude of 1000 feet. The train had scarcely left Cairns, when I began to observe species I had never seen before on the wing. The handsome blue *Papilio joesa* at once demanded attention, and then when Freshwater had been passed the equally beautiful *Cethosia chrysippe* was seen flying about. Leaving the flat country around Cairns the railway mounts along one side of the Barron Gorge, being cut out of one side. The tropical scrub is here seen on either side of the train and as each of the innumerable tunnels was passed through, fresh species appeared. On reaching Stoney Creek I was greeted by several specimens of *Troides euphorion* and so on until Kuranda was reached by the winding railway, 21 miles from Cairns.

Kuranda is a delightful spot to visit, to those who wish to escape the cold of a southern winter. The naturalist has here the opportunity of seeing the scrub at first hand and also his collections are increased by the forest species, which occur in the patches of forest country near by. To the Lepidopterist in addition to being a choice collecting ground, it is the home of our friend, Mr. F. P. Dodd, whose collection, even without the attendant delight of collecting oneself, is well worth the journey to inspect. During my ten days at Kuranda I determined rather than to amass a large collection, to see as many of the butterflies in life as I possibly could. In this I was ably seconded by Mr. Dodd and his sons, who took me here and there and so enabled me to observe fifty-three species during my short stay. Mr. Dodd's garden is essentially an entomological one. Plants are there to attract the insects, bright coloured *Hibiscus*, *Duranta*, *Dombeyia*, etc. In the early morning I used to visit the *Duranta* and select the best specimens of *Delias mysis*, *D. nigidius*, and *D. nigrina*, which before the day became too hot, used to crowd its purple blos-

som. Whenever a specimen of *T. euphorion* or *P. joesa* was seen flying about, I would take my stand near a red *Hibiscus* or other bright coloured flower, which the insect would be sure to visit. A tall flowering tree on the edge of the scrub was found, around which several specimens of the pretty little *Cyaniris tenella* and the beautiful *Danis serapis* were caught. In one of the side streets both sexes of *Hypolimnas misippus* were caught on several days. *Eurycus cressida* was seen laying its bright yellow eggs on an introduced species of *Aristolochia*, and amongst the flower buds of a creeper I was fortunate in finding several greenish larvae of a Lycaenid. These, later on, turned to pupae and after my arrival in Sydney emerged, giving me a nice series of *Catochrysops plattissa*. One day I secured five pupae of *Troides euphorion* suspended on a *Duranta* and though I searched very thoroughly I was unable to find any of the food plant, *Aristolochia*, of their larvae in the vicinity, and so concluded that they had devoured the whole of its leaves before pupating. This clearly shows how an erroneous statement could be made in perfectly good faith, for *Duranta* is certainly not the food plant of this species. Specimens that emerged from these pupae in Sydney are exhibited to-night. Numerous specimens of *Junonia albicincta* and *Precis zelima* were seen along the railway line, and on the open grassy places *Terias lineata* was very plentiful. Many larvae and pupal skins of the anomalous *Euschemon rafflesia* were found, which from their close resemblance to the true Hesperid *Netrocoryne repanda*, leave no doubt in my mind, that this insect belongs to the *Hesperidae*.

Later, three days were spent on the flat country nearer Cairns. Here on Freshwater Creek *Papilio joesa* was seen in all its glory flying around the trees lining the banks of the creek—in truth a glorious sight, with the green foliage and the added charm of the flowing water. Here, too, *C. chrysippe* was not uncommon, but its quick flight made it difficult to secure. The pretty little *Tellervo zoilus* was also caught, a black and white species with yellow eyes, from which the colour fades soon after death. Though *Delias* were plentiful at Cairns *D. nigridius* was quite absent, this species never descending the range. *D. argenthona*, however, was much commoner than at Kuranda. In the mangrove swamp *Miletus narcissus* was caught and in Cairns itself, I found the keel-shaped pupae of *Catopsilia pomona*. *Neptis shepherdii* was plentiful just off the ocean beach and many specimens of the brilliant *Arhopala amytis* were observed.

The noticeable feature was the comparative absence of Skippers, only ten species were caught and of these very few specimens. The tropical scrubs without doubt, do not produce a large number of this group and I believe that they should rather be looked for in the forest country. The Blues also did

not come up to my expectation either in quantity or numbers of species, but this would certainly be remedied in the rainy season. The larger butterflies predominated much more than with us in the south.

In all, I succeeded in capturing at Kuranda and Cairns, 70 different species and was able to recognise five other large species, that were easily distinguished on the wing. To this, perhaps, may be added one or two Blues, that did not allow me to approach sufficiently close to secure an accurate determination of the species. I would warn our southern entomologists, that such a result as this cannot always be expected during the winter months in the north, for I was fortunate in having exceptional weather and many species were caught that my friend, Mr. Dodd, had not observed so late as July in previous years.

My stay in the Cairns district was made particularly pleasant by my kind friends, Mr. and Mrs. Dodd, and here I had the pleasure of meeting several other naturalists. After about a fortnight I left Cairns, wishing I could prolong my stay into several weeks.

Later in the month, in Brisbane, I added still further to the species observed on my trip and returned to Sydney with a total of 82 species. It must be noted that this number of species was obtained during the dry winter month of July, when very few species are on the wing in Sydney and none in Victoria. In itself the number forms a good representative collection of the butterflies of Eastern Australia and would be a welcome addition to a beginner, who had had a year's collecting in the south.

The following list of species at the different stations arranged, according to my catalogue, published by this Club, shows the result of my trip and gives many new records for the month of July.

Kuranda.—*Danais menippe*. *D. petilia*, *Tellervo zoilus*, *Acraea andromacha*, *Cethosia chrysippe*, *Cupha prosope*, *Cynthia ada*, *Junonia villida*, *J. albicincta*, *Precis zelima*, *Hypolimnias bolina*, *H. alimena*, *H. misippus*, *Doleschallia australis*, *Melanitis leda*, *Mycalopsis terminus*, *M. sirius*, *Hypocysta adiante*, *H. metirius*, *Ypthima arctous*, *Cyaniris tenella*, *Danis serapis*, *D. taygetus*, *Candalides helenita*, *C. hyacinthina*, *Nacaduba dion*, *N. dubiosa*, *N. felderi*, *Catachrysops cnejus*, *C. platissa*, *Zizera labradus*, *Arhopala amytis*, *Pseudonotis turneri*, *Terias lineata*, *T. libythea*, *T. hecabe*, *Delias nigridius*, *D. mysis*, *D. nigrina*, *D. argenthona*, *Troides euphoron*, *Papilio aegeus*, *P. joesa*, *P. macleayanus*, *Eurycus cressida*, *Notocrypta feisthameli*, *Hesperilla croceus*, *Telicota angias*, *T. marnas*, *Erynnis mathias*, *E. fuliginosa*, *Apauustus sunias*, *Euschemon rafflesia*—53 species.

Cairns.—*D. menippe*, *D. petilia*, *D. affinis*, *D. hamata*, *Euploea sylvester*, *T. zoilus*, *A. andromacha*, *C. chrysippe*, *C. prosope*, *J. villida*, *J. albicincta*, *P. zelima*, *H. bolina*, *H. alimena*, *H. misippus*, *Neptis shepherdii*, *N. consimilis*, *N. staudingereana*, *Mynes godeffroyi*, *Charaxes sempronius*, *M. leda*, *M. sirius*, *M. terminus*, *T. arctuous*, *Danis arinia*, *D. serapis*, *D. taygetus*, *Miletus narcissus*, *C. erinus*, *C. margarita*, *Megisba nigra*, *N. dubiosa*, *Lycaenesthes affinis*, *L. geoffroyi*, *Tarucus telicanus*, *C. platissa*, *A. amytis*, *Hypolycaena phorbas*, *Terias hecabe*, *T. libythea*, *D. argenthona*, *D. nigrina*, *D. nysis*, *Huphina scyllara*, *Catopsilia pomona*, *T. euphorion*, *P. aegaeus*, *P. joesa*, *E. cressida*, *T. augias*, *T. marnas*, *E. mathias*, *E. ohara*, *A. sunias*, *A. walkeri*, *A. lascivia*—56 species.

Townsville, including Magnetic Island.—*E. corinna*, *A. andromacha*, *H. bolina*, *H. misippus*, *J. albicincta*, *M. leda*, *C. erinus*, *L. gaika*, *C. cnejus*, *T. hecabe*, *D. argenthona*, *C. pomona*, *P. aegaeus*, *E. cressida*, *E. mathias*, *E. palmarum*—16 species.

Brisbane.—*E. corinna*, *H. bolina*, *Jamides phaseli*, *L. labradus*, *T. hecabe*, *T. smilax*, *T. libythea*, *Elodina angulipennis*, *E. parthia*, *D. argenthona*, *D. nigrina*, *P. choredon*—12 species.

A STUDY OF WATTLE TREES (ACACIA) AND A LIST OF INSECTS OF WATTLE TREES.

(By W. B. Gurney, F.E.S.).

It occurred to me the work of members of the Club would prove more interesting and the results would be more valuable if some specific line of study was undertaken in addition to the general collecting and observations already engaging members. For these reasons I suggested at the general meeting held in October last that investigation by all members, junior and adult, might be commenced upon some such subject as "The Foods and Habits of Australian Ants," or "The Insects of Wattle Trees," and much extremely interesting information could be accumulated. The matter was discussed by the meeting and finally on the suggestion of Mr. G. A. Waterhouse it was decided to adopt "The Study of Wattle Trees," to include the botany of Acacia trees, the insects, mites and fungi which frequent these trees and the geological distribution of wattle trees of Australia. This more embracing subject title brings the members interested in different branches of natural history into the work and will appeal to most in these several directions. Moreover, the Wattles (Acacia) are national and widespread plants found throughout all the States and the genus comprises over 400

Australian species. This common subject for investigation offers itself to country and city members alike and both junior and adult members are asked to direct special attention to this field-work. Specimens of, and notes on, the wattles found in their particular districts and their geological distribution are of interest. Of the Fungi of wattles mention may be made of the well-known galls or swellings formed on stems, leaves and pods of wattles due to the presence of rust fungi. McAlpine mentions 32 species of wattles affected by these rust fungi of which he records *seven* species of the genus *Unromycladium* and *three* species of the genus *Uromyces*.

acid These rust fungi are not to be confused with wattle galls formed by insects such as flies and thrips, or the better known ~~wind~~ galls of Eucalyptus trees. The rust galls on the wattles, are, however, found to be infested by insects, moths, beetles, etc., which feed in these galls and which require identifying, as little is known of them.

With regard to the insects of wattles a great amount of collecting and observation is necessary; comparatively few have been identified as yet, and the life histories of several only are known. There is, therefore, an almost untouched field in this direction for members to work in, *viz.*, the life stages and habits of the wattle insects and also of the mites. Nothing hardly can be considered too insignificant to record on the manner of egg-laying, and metamorphoses and habits of these forms. The life histories of such very common forms as the Diamond Weevil (*Chrysolophus spectabilis*), the red-backed weevil (*Rhinotia hoemoptera*), the various common weevils of the genus *Belus*, and of common Longicorn and Buprestid beetle borers, and flies and bugs of wattles are not yet recorded at all, or only indicated by a few observations.

Therefore, let no one on the score of want of knowledge consider he or she cannot record something of interest; and at the least the work will add to one's personal knowledge. All that is required is accuracy of observation and, as far as possible, specimens of the plants, insects, or fungi concerned, for identification.

Specimens and notes should be sent to the secretary and they will be exhibited or read at the meetings, the specimens identified and the notes arranged and condensed by the publication committee for publication in the issues of our journal with due acknowledgment of those contributing information.

I give herewith a list of insects recorded on Wattles, which though not complete indicates some of the commoner forms and a further list, supplementing this, will be published next issue. Among papers recording insects on wattles, Mr. W. W. Froggatt has published an excellent one on "Wattle Insects," with illustrations, in the "Agricultural Gazette," for 1902, to which students are specially referred. Mr. Best has recorded some in the "Victorian Naturalist" and A. M. Lea in the

"Proceeding of Linnean Society of N.S.W." Apart from the three commoner butterfly forms, *Ialmenus evagoras*, *I. ictinus*, and *Charaxes sempronius*, Mr. G. A. Waterhouse has recorded four species of "Blues" as wattle feeders. Students should also consult Froggatt's "Australian Insects" and Rainbow's "Guide to the Study of Australian Butterflies." A number of beetles and parasites I have myself taken or developed, and some new records, and others recorded, but not listed here, will be included in the supplementary list. In conclusion, members are requested to forward wattle specimens and notes as before indicated for record in the notes for the next issue of the journal.

LIST OF INSECTS ON WATTLE TREES.

LEPIDOPTERA—Butterflies: *Ialmenus evagoras*, *Ialmenus ictinus*, *Ialmenus daemeli*, *Ialmenus lithochroa*, *Pseudalmenus myrsilus*, *Miletus delicia*, *Charaxes sempronius* (The Tailed Emperor). The larvae feed on the foliage.

MOTHS—*Teara contraria*, larvae social, form silken common home or bag; *Euchloris submissaria*, Looper caterpillar; *Zeuzera eucalypti*, larva a large white grub bores in the trunk; *Teia anartoides*, hairy tufted caterpillar feeds on the foliage.

COLEOPTERA (Beetles)—Fam. Curculionidae (Weevils: the larva are woodboring grubs), *Chrysolophus spectabilis* (Botany Bay Diamond Beetle), *Orthorrhinus klugi* (the smaller elephant beetle), *Leptops tribulus*, *Belus semipunctatus*, *Belus bidentatus*, *Belus edentulus*, *Belus phoenicopterus*, *Belus sparsus*, *Belus brunneus*, *Rhinotia hoemoptera* (a red backed weevil), *Myrmacielus formicarius* (small glassy black weevil), *Laemosaccus* sp. Fam. Anthribidae (Flower beetles).—The larva are generally broad headed wood boring grubs), *Agrius australasiae*, *Cisseis maculata*, *Cisseis cyanipes*, *Cisseis leucosticta*, *Cisseis semi-scabrosa*, *Cisseis similis*, *Melobasis splendida*, *Melobasis iridescens*, *Stigmodera rufipennis*, Fam. Cerambycidae ("Longicorn" beetles)—The larva are flattened elongate wood boring grubs, *Hebecerus marginicollis* (larva bores in wattles), *Hebecerus crocogaster* (larva not recorded), *Hebecerus australis* (larva not recorded), *Pentacosmia scopara*, *Stephanops nasula*, *Pachydissus sericus*, (larva bores in trunk and limbs), *Sybra acuta*, *Syllitus grammicus* (larva bores in branches), *Uracanthus triangularis*, ("Triangular marked Longicorn"), *Lygius mendica*, *Didymocantha obliqua*, *Iotherium metallicum*, *Symphyletes vestigialis*, *Symphyletes albocinctus*, *Phoracantha fallax* (larva bores in trunk and limbs), *Bethelium signiferum*, *Neissa inconspicua*. Fam.: Chrysomelidae (Leaf eating beetles): *Calomela paralis* (larva and adult found on foliage), *Calomela curtisi*, *Paropsis immaculata*, *Paropsis orphana*, *Elaphodes tigrinus*, *Cryptocephalus* sp. Fam.: Scarabaeidae: *Diphucephala aurulenta*, *Anoplognathus flavipennis*. Fam.: Coccinellidae: *Scymnus notescens*. DIPTERA (Two-winged flies)—Fam.: Cecidomyiidae: *Cecidomyia acaciae-longifoliae* (a gall making fly). Hemiptera (Bugs,

scale insects etc.):—Fam.: Pentatomidæ: *Eumecopus australasiæ* (large plant bug), *Popcilometrus strigatus* (large plant bug). Fam.: Membracidæ: *Sextius virescens* (green frog hopper; young and adults suck sap from foliage). *Sextius depressus* (closely allied to proceeding species). Fam.: Coccidæ:—*Rhizococcus viridis*; *Icerya purchasi* (Cottony cushion scale). Fam.: Psyllidæ:—*Psylla acaciæ-dealbatæ*, Froggt., *Psylla acaciæ-decurrentis*, Froggt., *P. acaciæ-baileyanae*, Froggt., *P. acaciæ-juniperinæ*, Froggt., *P. acaciæ-pyenanthæ*, Froggt., *P. acaciæ-pepduleæ*, Froggt., *P. lidgetti*, *P. frenchi*, *P. candida*, *P. gracilis*.

HYMENOPTERA: Fam.: Megalyridæ: *Megalyra* spp.

REVIEW.

"THE PINES OF AUSTRALIA."

By R. T. Baker, F.L.S., and H. G. Smith, F.C.S., Sydney,
Government Printer, 1910.

THIS beautiful volume is a worthy sequel to: "A Research on the Eucalypts," by the same authors, published in 1902.

The arrangement of the present volume is on similar lines to that on the Eucalypts, there being first of all a general summary and historic statement followed by a detailed account of the different species dealt with. Near the beginning of the volume the authors give a useful summary of conclusions which forms an excellent introduction, bringing out the main points arrived at in the research and leading the way to a good understanding of the work and its scope.

Callitris, in the able hands of the authors, proves to be a wonderful genus, quite a classic in its way, and certainly equal in interest to the Eucalypts themselves.

It is extremely interesting to see how the results of the chemical examination of the oils yielded by the various species of pines, leads to a system of classification based on well-marked morphological characters of the leaves as was first shown by the authors to be the case with the Eucalypts, and how different also in many cases are the oils yielded by the leaves and fruits of the same tree.

A very striking feature of the research is that the complete examination which the authors have made has led them to restore many species established by Robert Brown and Allan Cunningham, which had been suppressed on purely morphological grounds by subsequent workers. What a tribute is this to the insight and ability of these grand old botanists!

The results of this investigation lead not only to a clearer differentiation of species but also of Genera.

The whole work is a speaking tribute to the value of Botanico-Chemical research and fully justifies the early faith of the authors.

The volume is beautifully got up, the coloured plates of micro-sections being particularly fine and altogether the work reflects the greatest credit on the authors and on the Government Printer by whom it is issued.

THOS. STEEL.

EXCURSIONS.

THE Excursion to Como, on Saturday, October 8th, was marked by the capture of a number of specimens of both sexes of the rare Lycaenid butterfly *Miletus hecalius*, Miskin. This species was found flying round *Pomaderris elliptica*, upon which it is very possible that its larvae feed. During the last eleven years only two specimens of this species had been caught at Como, though it had been diligently searched for. On one occasion Mr. J. A. Kershaw took it plentifully in Victoria, but all other records are of single specimens. The following butterflies were also caught:—*Pyrameis kershawi*, *Heteronympha merope*, *Hypocysta adiante*, *Hypocysta pseudirius*, *Theclenesthes onycha*, *Neolucia agricola*, *Nacaduba biocellata*, *Poliommatus boeticus*, *Mesodina halyzia*, *Hesperilla perfonii*, *Hesperilla parvulus*, *Trapezites eliena*, *Trapezites petilia*, *Apaustus sunias*.—G. A. WATERHOUSE.

ON Saturday, November 5th, Mr. W. B. Gurney, F.E.S., conducted an excursion to Maroubra. The weather was so delightful that a large number of members—some thirty or thereabouts—accompanied the leader. Although a number of botanists were present, the greater majority of those attending, confined their attention to entomology, and a large number of beetles, including species not altogether common, were obtained. It was intended that a list of these should be published, but owing to extreme pressure on his time, and having little available leisure, the President has not been able to prepare it in time for this issue. Suffice it to say that all who attended, not only enjoyed the afternoon's outing thoroughly, but also gained some interesting information.

NOTES AND COMMENTS.

NOTE.—Members are requested to note (per page ii. of cover) that the Council has reduced the price of publications held in stock. Those members who are desirous of adding any of these to their private libraries cannot do better than avail themselves of this opportunity. Also attention is drawn to Messrs. Angus and Robertson's advertisement on page iv. of cover.

THE
Australian Naturalist.

VOL. II.

APRIL 4, 1911.

PART 6.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The ordinary meeting of the Club was held at the Royal Society's House, on Tuesday, February 7, 1911, the President, Mr. W. B. Gurney, F.E.S., in the chair.

ELECTION.—Miss Harper, Miss Susie Harper, and Mr. Lichtmann were elected members of the Club.

NOMINATIONS.—Miss Claque and Mr. O. C. Dyer were nominated for membership.

LECTURE.—Mr. T. Steel, F.L.S., F.C.S., delivered a lecture entitled "Natural History Miscellany." The exhibits accompanying the lecture were unique, and the evening proved a great success. The lecturer was warmly applauded and was accorded a hearty vote of thanks.

ORDINARY MEETING.—The ordinary meeting of the Club was held on Tuesday, March 7th, 1911, the President, Mr. W. B. Gurney, F.E.S., in the chair.

ELECTION.—Miss Claque and Mr. O. C. Dyer were elected members of the Club.

LECTURE.—Mr. C. Thackeray delivered a lecture on "Some Edible Fishes of New South Wales." The speaker illustrated his remarks with lantern slides, and gave a most interesting account of many of our river and salt water fishes. He was accorded a hearty vote of thanks on the motion of Mr. Stead, seconded by Mr. Edwards.

EXHIBITS.—Mr. Stead showed the photograph of a crab which lives on cocoanuts; Master Reuter Knief a collection of beetles; Master Oliver Edwards larvae of cup moth and some Macleay swallowtail butterflies. Mr. Froggatt, F.L.S., exhibited a jar containing larvae and pupae (about 1000 specimens) of the mosquito *Culex albomaculatus*, together with perfect insects of the same species, and contributed the following note:—"These mosquitoes were all taken in about a quart of water at the bottom of a tin in my garden; another small tin, half buried in the soil, containing about a table-spoonful of water and mud, had about 50 active small larvae; a water-jug in one of the bed-rooms, half-full of water, which had not been disturbed for several days, also contained

about 50 active larvae. Now if we find a dozen hungry mosquitoes in the room we consider them a pest, yet every suburban resident with a garden and fernery is breeding his own mosquitoes, and a few over for his next door neighbour. Mosquitoes do not travel very far, nor do they breed to any great extent in large holes or deep water, because in such places they have many enemies in other insects, tadpoles and small fish. It is in the old tins, buckets and tubs around the house that our house-hunting mosquitoes are usually born. At this time of the year, if every householder was to go carefully over his ground and house, he would be almost certain to find mosquito larvae somewhere close at hand in most unsuspected places, and by disturbing these, would soon reduce the number in his dwelling. If you will place a dish of water anywhere in the garden under the trees, and examine it in the morning, you will at this time of the year find one or more boats of mosquito eggs floating on the surface."

NOTES ON WATTLES.

(By Edwin Cheel.)

THE name *Acacia* appears to have been founded by Tournefort in 1837, and is probably derived from *ac*, a point, in Celtic, or from the Greek *Akazo*, to sharpen, in allusion to the spiny characters of the first species described which were obtained from Africa or Asia. The various species were formerly classed under the name *Mimosa*, a genus established by Linnaeus, but are now separated from that genus by well defined characteristics. The main difference of the genus is in the indefinite number of stamens and free filaments. In the closely allied genera the stamens are definite; that is to say, they are either equal in number, or twice as many as the number of petals. The inflorescence of the genus *Acacia* are either arranged in little rounded heads or in cylindrical spikes, and when closely examined with a pocket-lens it will be found that these heads or spikes are made up with tiny flowerets. These little flowerets each have four or five tiny sepals and petals, or rarely less than that number, which during the early stages of the flowerets afford protection to the delicate stamens and pistil. When the stamens are fully developed they expand, and thus they resemble whitish or golden fluffy little balls when they are in heads, or when they are arranged in spikes they somewhat resemble the amenta or catkins of the willows.

There are upwards of 500 species of the genus *Acacia* known to science, which are distributed chiefly in tropical or sub-

tropical regions, and in Australia and the adjacent Islands, excluding New Zealand. In Bentham's "Flora Australiensis" there are about 313 species recorded, and these are also given in Mueller's "Census" published in 1889. Since the publication of the "Census" about 117 species have been added, which makes a total of about 430 species or varieties recorded for Australia. Of this number the National Herbarium at Sydney contains 366 species or varieties.

By far the greatest number of species of Australian Wattles belong to the Phyllodineous group, which, instead of developing true leaves, produce phyllodes, a term derived from the Greek *phyllon* (pronounced ful-lon), a leaf, and *eidos* (pronounced i-dos), form, and which, therefore, means having the form or semblance of a leaf.

Although the phyllodes are not leaves in the true sense of the term, yet they perform all the functions of a leaf. Many of the Phyllodineous *Acacias*, instead of developing the dilated phyllodes as in *A. longifolia* or *A. prominens*, produce either long and slender and acutely pointed phyllodia as in *A. calamifolia* or *A. pugioniformes*; or, in the case of *A. juniperina* and several others of this group, the entire foliage of the plants consists of needles, somewhat resembling those of the common English Furze or Gorse. Several of the *Acacias* are of extremely ancient renown, as representatives of the genus occur in Egypt, Arabia, and Palestine. One or two of them are referred to in the Old Testament under the name of Shittah-Tree, the produce of which was the Shittim-Wood employed for constructive purposes, and has been identified as *Acacia seyal*. This species also yields the common gum-arabic, and apparently it is the only timber in the desert where it is still found in the driest situations. It abounds in the sultry Oasis, the Plains of Shittim (Moab, Num. 25, 1). It is a very hard and close grained wood, of a fine orange-brown colour. The wood-work and furniture of the Ark and the Tabernacle were made of this timber.

Nearly all the Egyptian and Arabian species, and also a number found in tropical regions, produce perfect leaves of the pinnate and doubly-pinnate type, as is seen in the bipinnate group of Australian species, such as *A. farnesiana*, *A. decurrens*, and *A. baileyana*, etc. Several Australian species also produce timber of considerable value, as, for example, the "Blackwood" (*A. melanoxylon*), "Raspberry Jam-Wood" of West Australia (*A. acuminata*), and *A. peuce*, a native of Central Australia, which produces a dark-coloured wood of special value, as well as other species too numerous to mention here. Several species are cultivated very extensively in America and South Africa, chiefly for the tannins

and gum contained in their barks, while in Australia the bark is stripped off the trees where they grow under natural conditions and used by the tanners. In the western districts of New South Wales the Mulga (*A. aneura*) is prized very much by stockowners, as it furnishes valuable food for their stock.

In Europe several species receive special attention under hothouse and greenhouse culture, where they are grown as ornamental shrubs, and quite recently it was reported that hybrids have been produced as the result of hybridization between *A. podalyracifolia* and *A. dealbata* and other species, the former being the mother plant of the hybrids.

NATURAL HISTORY MISCELLANY.

(By T. Steel, F.L.S.)

THE Australasian region is, from a biological point of view, one of the most interesting in the whole world. A great number of the plants and animals occurring in this region, are found nowhere else, and, as a matter of fact, are survivals from a former geological period. In other parts of the world we find fossil remains of organisms corresponding to what constitute the living fauna and flora of Australia. Naturally this peculiarity has attracted a great deal of attention from naturalists, for the study of what one writer has termed the "living fossils" of Australia, is of enormous assistance in unravelling the intricate problems involved in the life-history of existing organisms and in tracing the nature and relationship of fossil remains occurring in other parts of the world.

Briefly, the reason for the existence of this state of matters in Australasia may be put in the one word—*isolation*. Very early in its history, Australia, with its girdling islands, was cut off by a barrier of ocean from the mainland of Asia, and so was left to develop in its own way. The large active carnivorous animals, such as the tiger, the leopard, etc., never got a footing here, and for this reason the comparatively helpless marsupial was enabled to attain a degree of development which would otherwise have been impossible, and to become in fact the dominant feature of Australian animal life. The influences brought to bear on the development of the plants and animals of the Australian region through the migration of denizens of Africa and South America by way of a former southern bridging continent, does not lie within the scope of this paper, but it forms a most interesting story.

To-night it is my purpose to take a few characteristic Australian and New Zealand creatures, and to endeavour to give

you some little information regarding them, the specimens in illustration being selected from my own collection.

We will begin with *Ceratodus*, the well-known Dipnoid fish, which is now found only in the Mary and Burnett Rivers in South Queensland. Dipnoid is a term derived from two Greek words signifying "twice" and "breath," and at once explains the peculiarity that has made this creature famous, it being provided with a lung in addition to the usual gills. Popularly *Ceratodus* is known by a variety of appellations, such as "Burnett or Mary River salmon"; but with these we need not trouble ourselves. *Ceratodus* is truly one of Australia's "living fossils," as, in so far as we can judge, it differs in no essential respect, either of structure or appearance, from its distant ancestors which existed away down the abyss of time in the Palaeozoic period. It is a wonderful thing that this fish should have survived practically unchanged, down such an unthinkable long period, and it seems the more remarkable when we remember what a helpless sluggish creature it is, and how ill adapted for migration. Not only are the eggs of *Ceratodus* far too fragile and delicate to be transported like those of many other fish, on the feet or feathers of birds, but the creature itself is absolutely helpless on dry land, in spite of its lung, and can only travel by water from one spot to another. It never goes into brackish water, but confines itself entirely to fresh. The lung is really the swim-bladder modified, and the fish can use either this or its gills for breathing. The time when the lung is most useful is when through the drying up of the river in which it lives, it becomes stranded in stagnant putrid pools in which other fish quickly die. Here *Ceratodus* can live apparently quite at ease. Normally it uses both means of breathing, coming to the surface for the purpose of refilling its lung. Only two other Dipnoi are now found living, these being *Lepidosiren* in the River Amazon and *Protopterus* in West Africa. In order to better distinguish it from its fossil relatives *Ceratodus* is now known as *Neo-ceratodus forsteri*, Forster's New *Ceratodus*. You will observe the curious large scales and the remarkable limbs or paddles. For the loan of the beautiful coloured model, which was taken from my specimen, I am indebted to Mr. R. T. Baker, of the Technological Museum. Another creature of the greatest interest is the Marsupial mole (*Notoryctes typhlops*, Stirling) (literally, blind southern animal). This beautiful little marsupial, which as its name implies, is totally blind, occurs only in the sandy wastes of Central Australia. Its food seems to consist of worms and small insects, in pursuit of which it burrows with amazing ease through the sand, coming at intervals to the surface. Notice how beautifully adapted are the powerful fore claws.

for breaking a path through the sand, and the hind ones for pushing away the excavated material, while the snout is protected by a horny cap. The ears also are closely covered with hair, so that sand is effectively excluded. There is not the slightest external trace of eyes, but examination shows beneath the surface of the head a vestigial eye, proving that the ancestors of this little creature were able to see. Miss Sweet, of Melbourne, who has done some excellent work on the subject, found that all traces of iris, lens, retina and optic nerve have practically disappeared, the eye proper being represented only by the pigmented choroid—the coloured membrane of the eye. It is most interesting to note further that the lachrymal gland—the organ which secretes tears—is of large size and discharges into a sac formed by the remains of the eye-lids, which in turn is connected to the nose by the usual nasolachrymal duct. In this way provision is made for the adequate lubrication of the nasal cavity. The skeleton possesses well-marked avian characters.

In the desert centre of Australia every plant or animal has more or less adapted itself to the onerous conditions of life ruling there. Plants, to survive at all, must make the most of the short periods of moisture, and it is found that seeds of the indigenous plants germinate, the plants grow, blossom and mature their seed with astonishing rapidity. Professor Spencer in his *Narrative of the Horn Expedition*, gives much extremely interesting information on this point and on the manner in which the animals also have responded to the dictates of grim necessity, for their very existence depends on this power of adaptability. The Honey Ant of Central Australia (*Camponotus inflatus*, Lubbock) is an excellent example of one kind of adaptation. During the very short season when the Psyllidae and Coccidae are secreting their sweet nectar the ants must collect and store sufficient honey-dew to serve the wants of the community until fresh supplies are again available. There being no convenient means of constructing cells such as those made by bees, certain of the worker ants are turned into living stores, they are fed with nectar until their abdomens become swollen into a large sac, the abdominal segments appearing as isolated plates on the membranous surface. The ants so treated are quite unable to move about, and merely hang in the nest ready to discharge their sweet nectar when required. Another species brought from Central Australia by Professor Baldwin Spencer, and named *Camponotus cowlei* by Mr. Froggatt, has the same habit, but the individuals chosen for honey storing purposes do not become nearly so much swollen and are able to move about in the nest. *C. cowlei* is a much rarer insect than *C. inflatus*, only one nest having been found. The specimens of both species

exhibited were collected and given to me by Professor Spencer, to whose kindness I am in many ways indebted.

Another Australian ant, very common on the Blue Mountains (*Camponotus intrepidus*), constructs a curious chimney or tube at the entrance to its nest. The tube is composed of sand-grains and tiny bits of vegetable matter somewhat loosely cemented together, and is frequently as much as three inches in height by about half an inch in diameter. It is by no means clear what object is served by the tube, it is certainly not for keeping out water, as it is much too fragile and porous for that, and the nests are usually constructed in well-drained places. A series of these tubular nest entrances is on the table. Another extremely common and conspicuous ant is the dark "Bull-dog" (*Myrmecia forficata*), with its formidable sting and large forceps-like jaws. This is an extremely pugnacious insect, and vigorously resents any interference with its nest. On one occasion I found an ant of this species which had lost its abdomen and one of its hind legs, hopping about quite active and lively, on duty guarding the entrance. One can only speculate how it came to be so severely maimed, probably it was in the execution of its duties. At first sight I did not recognise what kind of creature it was. In spite of such a serious disability it gave no evidence of being inconvenienced. Having carefully preserved this intrepid sentinel, I am able to show it to you.

Many species of ants all over the world derive part of their food supplies from the sweet secretion of different kinds of Coccidae, Aphidae and the larvae of Psyllidae and other insects infesting Eucalypts and many other plants. These are commonly known as "ant-cows." A very large and helpless Coccid, *Lecanopsis filiceum*, Mask., occurs commonly in various parts of Australia on the underground rhizomes of the bracken fern within the burrows of an ant, *Iridomyrmex*. I have frequently found them under logs where the ants had built their nests. This creature is about half an inch in length and is of a dark-brown colour, and possesses very small inconspicuous limbs, which are quite useless for walking. It depends entirely on the ants for its well-being. The ants appear to look after the young, placing them in suitable positions on the fern rhizome, to which they attach themselves by means of the proboscis and a whitish gummy secretion. When once attached they do not shift. They live entirely on the sap of the plant. A small Aphide, *Aphis avernae*, occurs in a similar manner on grass stems in the nest of a little ant (*Iridomyrmex*), while another, *Dactylopius* sp., lives on the rootlets of *Eucalyptus*, and is also the host of an ant, *Iridomyrmex gracilis*. I am able to show you the specimens of all of these.

When turning over logs in different parts of New South Wales, such as in the South Coast district and on the Blue Mountains, one frequently finds a large slug having a red margin round the lower edge of its body and a triangular shield, also bordered with red, near the head. This is *Ani-tea graffei*, a peculiar slug possessing only two tentacles or horns, the usual number in other slugs being four. Another species, *Genella bitentaculata*, occurs in New Zealand, and has a beautiful pattern resembling the venation of a leaf on its dorsal surface. If I mistake not, these are the only known bitentaculate slugs. Specimens of both are exhibited, some of *A. graffei* being alive.

An interesting fresh-water crustacean, *Apus*, occurs in Australia in common with many other countries. It is furnished with a peculiar carapace deeply notched behind where the long jointed tail protrudes. It is probably the largest existing Entomostracan (literally "shelled-insect"), and is the most archaic type of living crustacean. For my specimens I am indebted to Mr. Froggatt.

When in Brisbane some years ago my attention was directed by my friend, Mr. W. E. Appleby, to a little mason wasp, *Alastor eriurgus*, Saus., which normally constructs its brood cells of clay. Finding the gum which exudes from the introduced Mango trees a convenient material for the purpose, the insect has taken to using this for its cells. But after a time the mango gum becomes exceedingly hard and tough, with the result that the young wasps are unable to cut their way out, and so perish in the cells. The specimen of mango-gum cells which I have here shows a young wasp which has met this fate.

In the mangrove swamps of Queensland, many of the South Sea Islands, Malaya and other places, a very curious little fish is to be seen in large numbers leaving the water and hopping about with great speed and agility on the muddy banks and even amongst the branches of the trees. This is *Peiropthalmes kohltreutheri*, Pallas, the climbing fish. It is a true goby, and the hopping motion is performed by means of the strong pectoral and ventral fins. You will notice from the specimens how prominent are the eyes, the fish has the power of moving these about somewhat after the manner of the stalk-eyed Crustacea. The late Rev. Tenison-Woods mentions that the Malays call it Ikan lesah—the restless fish—and that though it is eaten by the poorer classes, it is not considered wholesome food.

Everyone here has many times seen stuffed specimens of the *Platypus*, that wonderful anomalous monotreme, the most bird-like of all mammals. For a long time there was much doubt about the reputed egg-laying habit of this creature, but

largely through the labours of Dr. Caldwell, this was proved to be the case. Much interesting work on the embryology of the Platypus has been done by Professors Wilson and J. P. Hill. On examining the skin one notices two kinds of hair, long shiny hairs with thin stems and broad paddle-like tips and short, soft, dense fur. Skins prepared for rugs and such like frequently have the long hair plucked out. I am not able to show you an egg, but the portion of egg-shell which is here is sufficiently interesting to be worth looking at. I know of no more delightful description of the homes, haunts and habits of Platypus than that of that fine old naturalist, the late Dr. George Bennett, in his "Gatherings of a Naturalist." For the loan of the beautiful stuffed specimen exhibited I am indebted to our fellow member, Mr. C. Coles.

Amongst the creatures for which Australia is famous must be mentioned another which, like the Platypus, is quite a classic in the animal kingdom, and one in the study of which I have taken a keen interest for many years past, that is *Peripatus*. Briefly the reason why this little creature is regarded with so much interest is that it is a surviving ancestral type, which, like *Ceratodus*, has come down to us from distant geological periods, surviving through all the ages crowded with change and with the appearance and disappearance of countless competing organisms. And yet this feeble, lowly caterpillar-like animal has remained through it all, practically unchanged in the midst of change, giving us one of our rare glimpses of the living form of important organic types of distant geological periods. *Peripatus* represents the point in development from which sprang the two important orders, Annelida and Tracheata. In other words, *Peripatus* better than any other living creature retains in a Tracheate animal the annelid characters of the remote ancestor. The Tracheata includes all insects, and we have strong evidence that from annelid or worm-like ancestors sprung through *Peripatus* all our varied insects. *Peripatus* represents the fork in the genealogical tree at the spot where the annelids or segmented worms, breathing by their skin surface, became separated from the Tracheata which breathe by means of trachea or tubes running through the body. In Australia we have some five acknowledged species of *Peripatus*. A good many other species have been found in isolated spots in different parts of the world where the conditions chance to have been favourable for their survival. Thus, for example, species occur in New Zealand, New Britain, S. Africa, S. America, West Indian Islands, and a few other places, but nowhere common, and in most places exceeding scarce and difficult to find. For a long time it was supposed that all the species were viviparous, as most of them undoubtedly are, but some

years ago Professor Dendy, F.R.S. (then of Melbourne, now of King's College, London), discovered that two species occurring in Victoria, one of which also extends to Tasmania, and two or three species found in New Zealand were oviparous, the eggs possessing strongly marked *insect* character. This was an extremely interesting observation, as it gave further important evidence of the relationship of *Peripatus* to the Insecta. Professor Dendy founded the genus *Ooperipatus* for this interesting form, and we have in Victoria *O. oviparus* and *O. insignis*. During my investigations I have on several occasions found specimens of the first-named species in New South Wales, near Moss Vale, thus extending its range to within 100 miles of Sydney. *Ooperipatus* is characterised by the possession of a large fleshy ovipositor which is absent in *Peripatoides orientalis*, the species most frequently occurring in New South Wales. *Ooperipatus oviparus* has a beautiful diamond pattern on the dorsal surface by which it can be very readily distinguished from its relative *Peripatoides*. In New South Wales I have found *P. orientalis* to have a marvellous variation in range of colour, from deep black to a light tawny brown, with many intermediate colours. I exhibit a large series of this species of both sexes, illustrating this range of colour, and also examples of *O. oviparus* showing the characteristic ovipositor and dorsal pattern.

We will now consider a few characteristic New Zealand specimens, foremost amongst which comes the famous Tuatara lizard *Sphenodon punctata*. As most of you are doubtless aware, the earliest birds were derived from reptilian ancestors, and the relationship, particularly in the structure of the skeleton, can be readily traced in living birds and lizards. The great interest attaching to the New Zealand lizard under consideration, lies in the fact that it is the closest living link between the two orders. Tuatara constitutes an ancestral type surviving from long past ages, and retaining more than any other lizard the primitive avian characters. In other words, we may describe it as a bird which through some cause has stopped in the course of evolution. Other lizards have maintained their reptilian character and have gone on developing down the true reptilian line, the birds, meantime, having also continually diverged, each on its own course, until there has arisen the marvellous diversity with which we are now familiar. Curiously enough the Crocodile follows Tuatara as the next of kin to the birds, but the gap there is greatly wider, and to this interesting New Zealand lizard belongs the dignity of closest relationship with the birds. There is one character very well marked in *Sphenodon* in common with a great many other lizards, the possession of the pineal eye. If one looks closely

at the top of the head of a lizard such as *Alleobophora angulifer*, so common about the Blue Mountains, there will be noticed a small grey or whitish object like a little round scale. This is the pineal or vestigial eye, and is all that remains of the original large functional eye in the centre of the skull, which was possessed by such reptiles as *Ichthyosaurus* (fish-lizard) of the Oolite and Lias. In all living lizards now possessing it, the pineal eye is absolutely functionless in so far as seeing is concerned, and like the eye of the marsupial mole, retains only the partial remnants of what was originally a functional eye. In many lizards there is no external evidence of the existence of the pineal eye, whilst in others it is quite conspicuous.

In addition to those mentioned, I exhibit specimens of the following, which show the eye extremely well: *Veranus indicus* and *V. prasinus*, from British New Guinea, *Brachylophus fasciatus* from Fiji, and *Hinulia lesueurii* from New South Wales. The possession of this curious ancestral remnant is by no means confined to lizards, but it can be traced in very many animals. In man it exists as a minute knob on a short stalk away down in the middle of the brain, and is known as the pineal body, having originally been so named from its shape being something like that of a pine cone; and, what is most interesting and suggestive, the stalk on which it is situated springs from the junction of the two optic nerves, just above where they enter the brain substance. This curious organ was supposed by the French philosopher Descartes to be the seat of the soul, because it appeared to be the only part of the brain that was not in duplicate. Another highly characteristic inhabitant of New Zealand, unfortunately now extinct, was the strange wingless bird, the Moa. There are plenty of traditions amongst the Maori, of the contemporaneous existence of the Moa with the Maori race. The only relics now remaining are a few feathers which were discovered in a cave, and the bones and fragments of egg-shells which are found in various situations in different parts of New Zealand. There were a number of species of *Dinornis* and other genera of this wonderful bird, and I am able to show you bones of some of these. On one occasion I had the good fortune to find in a lava cave near Auckland the nearly complete skeleton of a small species, *Dinornis oweni* lying *in situ* where the bird had died. The skull was lying at the top of the line of bony neck rings, and all the other bones in their natural position; some of the bones had, however, perished through the dripping of water. This specimen is now in the Hunterian Museum, Glasgow University, to which institution I presented it some years ago.

While dealing with New Zealand objects I would just like

to show you specimens of the curious little fresh-water crab *Hymenicus varius* (*Hymenosoma lacustris*, Chiltern), which occurs abundantly in Lake Takapuna, an extinct crater forming a beautiful little lake some distance from Auckland, and has also been found on Lord Howe Island, in Victoria and Tasmania. This little crustacean appears to feed principally on a fresh-water sponge (*Spongilla*) which grows to a remarkably large size in the same lake. Specimens of both are exhibited.

Amongst the animals of New Zealand which have become extremely rare and which, if not extinct, exist now only in very circumstanced localities, are the Frog, *Liopelma hochstetteri*, and the Maori Rat, *Mus exulans*. *L. hochstetteri* is the only indigenous frog in New Zealand, and has always been extremely rare. It was first discovered in 1852, and Hochstetter states that even then it was so scarce as to be unknown to the natives. The specimen exhibited shows it to be a very beautifully marked creature.

The Maori rat, though not confined to New Zealand, being found in certain of the South Sea Islands, is now extinct in New Zealand except in one or two of the Barrier Islands. It is an interesting little creature, and has quite a classic history, the tradition being that it was brought from their original home, the island of Hawaiki, by the Maori who first went to New Zealand, so that it is well named *exulans*, the wanderer. It was much prized as an article of food by the Maori, and consequently was a scarce animal when the first white men visited New Zealand. It is related that a Maori chief on seeing the large European rats on board a visiting vessel, begged the captain to liberate some of them on the land so as to provide a larger game animal than their own rat. The Maori name for the native rat was Kioere.

And now a word or two in conclusion on the subject of the preservation of dry natural history specimens, and particularly insects. For many years I have experimented with different methods of treating insects to render them impervious to the pests which so quickly ruin a collection when not constantly watched and kept well supplied with naphthalene or the like. For a long time a solution of corrosive sublimate in spirit in which the insects, after setting, were dipped, was the best I knew. Contrary to what one might very naturally expect, however, the protection afforded by this very poisonous substance is of the most transitory nature, it being effective for only a very few months. The corrosive sublimate appears to gradually volatilise, leaving the specimens an easy prey to their enemies. These remarks apply to a solution of about 4 grains per ounce, which is as strong as can be used on beetles and such-like without causing a white incrustation on the sur-

face. Stronger solutions can be used with some insects and will be more permanent in their protective power. I have at last come across a medium which appears to be fairly lasting in character, not to corrode the pins, and not to disfigure the specimens. This consists of a very simple preparation, a saturated solution of common white arsenic in methylated spirit. A little white arsenic is placed in a bottle which is filled up with spirit and well shaken at intervals for a day or so. The clear solution after the surplus arsenic has settled to the bottom, is used. The best plan for beetles, flies, ants, and such like, is to place some of the poisoned spirit in a glass, kept for that purpose alone, and, taking the insect up by catching the pin on which it is set with the forceps, to dip it gently in the spirit so as to completely wet it; the insect may then be placed direct in the cabinet. Carded specimens are treated in the same manner. Butterflies and moths may also be treated in the same manner, and after drying there is but little clogging of the down. If preferred, however, the bodies can be painted on the undersurface with the spirit, by means of a soft camel-hair brush, the antennae also being touched. For large specimens or those already set out in the cabinet, a small dropping-tube with rubber bulb, such as is commonly used for filling fountain pens, answers admirably. The spirit can be very neatly and expeditiously dropped over the specimens so as to thoroughly moisten them. A little excess falling on the paper of the drawer does no harm, as it soon dries and leaves no stain. The arsenical spirit, being highly poisonous, should be carefully labelled, and with the glasses and appliances used for applying it, kept in a safe place. It would hardly be advisable to use this substance on the scale of a herbarium, for preserving plants which are usually kept somewhat loosely packed, as there might possibly be a sufficient evolution of arsenical vapour to be injurious in a close room. Insects, however, are so much smaller in bulk and are always kept in fairly tight cases, and I have never experienced the slightest ill effects, though I have used the solution somewhat extensively for a long time past. I exhibit a case of miscellaneous insects which have been treated by the method described, and have remained thoroughly protected for a period greatly exceeding that during which corrosive sublimate would have been efficient. I cannot yet say in how far the arsenical solution will be permanent in its effects, but it is at any rate considerably more so than corrosive sublimate. I have by its use protected specimens for at least six times as long as I have found the latter substance effective, and it will at least considerably reduce the labour of keeping a collection safe.

I may add that I am at present experimenting with a number of other substances, with a view to finding one with the necessary qualifications which will be quite permanent in its effects.

NOTES ON FUNGI.

(Abstract of) Lecture by Edwin Ocheil).

THE study of the vegetable features of most countries usually commences with the conspicuous trees, shrubs, or the more showy herbaceous flowering plants and also the ferns, while the lower forms of plant life (with, perhaps, the exception of a few forms of Agarics or the bracket-like Polyporaceous species) are very often quite overlooked except by a very few specialists. It is not generally known, even by many of our botanists, that the few Cryptogamic specialists, have, by their persistent labours been the means of bringing under notice in our scientific journals, no less than 49,000 species of fungi from various parts of the world, including the *Schizomycetes*, *Myxomycetes*, and the Lichen-forming fungi. The latter belong to the Ascomyceteae group of the Cryptogamic division of the vegetable kingdom.

A great many species of fungi are of immense economic importance inasmuch as a large number may be used as food, while others are deadly poisonous, not only to human beings, but also to the lower animals; some do immense damage, and cause great monetary loss by attacking wheat, oats, and other commercial crops. In ancient times many of the diseases peculiar to higher plant-life and which are now known to belong to certain well-known groups of the vegetable kingdom, were referred to by such terms as "blight," "blasting" or "mildewing" of the corn when seen in the wheat-fields, and a large number of the old farmers were under the impression that the diseases were caused through electrical disturbances. Even in 1833, Turpin and Unger, who were among the first to understand the symptoms of diseases of plants, thought that many of them were caused through the transformation of the cell-contents of the plants upon which they grow. Meyen, Kuhn, and Berkeley did good work towards clearing up the mystery of this branch of vegetable pathology, and in 1866 the foundation of our modern knowledge was laid by Professor De Bary.

SCHIZOMYCETES.—This is a group of organisms known as Fission-Fungi or Bacteria. They are very simple in structure and are either unicellular or filamentous. Some of the single-celled forms are rounded while others are rod-shaped. The Bacteriaceae is represented by upwards of 70 species and several of these are the cause of deadly diseases such as typhoid fever, pneumonia, cholera, diphtheria, and so-called white plague or consumption. Some of these minute organisms are the cause of the disease known as Apple or Pear Blight (also known as Fire Blight). These bacteria gain

entrance to the twigs of the apple or pear through wounds or through the flowers. They are easily carried by insects to the stigma of the flower and from this point work their way into the twig which, when infected, is eventually killed by the parasite. The leaves turn brown, as if scorched by fire, hence the name "Fire Blight."

Several species of Bacteria are very useful, as for example those found in the nodules of Leguminous plants and which assist in the manufacture of albumenoid substances.

MYXOMYCETES (Slime Fungi).—This is considered an independent group of organisms holding an intermediate position between plants and animals, and have in consequence been termed Mycetozoa or Fungus animals. It is an interesting group and contains a number of species of various shades of colour as white, yellow, red, brown, blackish and sometimes ashy-grey. They are mostly visible to the naked eye and are usually found in very damp places on rotten logs or timber. They are commonly known as slime-fungi, on account of the way in which the spore-walls break up, and the protoplasmic contents form a naked mass somewhat like a thick yellowish or milky fluid which is known as the plasmodium. This mass of plasmodium creeps about and lives on decaying matter and finally becomes dryer in character and draws itself up into a definite shape which is then known as the fruiting stage.

One of the commonest species of this group around Sydney is *Stemonites fusca*. It is simply wonderful in structure, as it is composed of a central column around which is formed a beautiful delicate net-work, known as the capillitium in the meshes of which are contained countless millions of brownish-coloured spores.

DISEASES IN PLANTS CAUSED BY FUNGI.—The Rusts and Smuts are well-known to many of our farmers throughout the State on account of the enormous damage caused by these minute parasites. At the Inter-Colonial Wheat Conferences held in 1890-1896, a great deal of discussion took place on the rusts in our wheat and other cereal crops, but so far no successful remedies have been found to eradicate them, and the only means of growing clean crops is by securing immune varieties on the lines suggested by the late Mr. Farrer.

In addition to the rusts found on cereals, we have a great number of species of the genus *Puccinia*, which infest many of our cultivated plants in Sydney and suburbs, as well as native wild plants within easy reach of the metropolis. Sun-flowers, Marigolds, Daisies, Hollyhocks, are all subject to infection. Several species of smut are also common on grasses around Sydney.

DOWNY MILDEW OF THE ONION (*Perospora schloeindeni*).—The mildew of the onion is a well-known disease in Europe and America and was recorded as having been found in this State by Dr. N. A. Cobb in the "Agricultural Gazette of N.S.W." (1891), p. 616, and in August last, I found it in the Illawarra suburbs, attacking a crop of eschallots. It is very destructive and causes extensive damage to onions and eschallots, as it spreads very rapidly during dull, damp weather. This fungus is closely related to the potato blight and the vine mildew requiring fairly high magnifying powers to make out its structure. When the plants are affected the leaves of the onions or eschallots lose their bright, glossy green appearance and turn a greyish-colour. If a portion of a leaf affected with the disease is placed under a microscope it will be seen that there are numerous little forked conidiophores or forked branches at the tip of which are little obovate or pear-shaped bodies. These organisms contain several minute swarm-spores which are analagous to seeds and when matured are hurled into the air and so dispersed to and infect other plants. When these minute organisms settle down on a plant the little swarm-spores are lashed about on the moisture laden leaves until at last they find a suitable spot; they next send out their germ-tubes and penetrate the stoma or breathing pores of the leaves and so spread the mycelium through the tissues of the plants. When plants are found affected with disease they should be sprayed with Bordeaux mixture to check the spread of the disease. Fresh slacked lime mixed with half the quantity of sulphur has also been found beneficial if used during the very early stages of the disease. All plants badly affected should be destroyed so as to prevent the winter spores being formed as they are provided with a thick protective coat and are very resistant.

THE SCLEROTIUM DISEASE (*Sclerotinia sclerotiorum*).—This is a very destructive fungus and causes considerable loss to cultivators of cucumbers, lettuce and other vegetables forced under glass in Europe and in the United States of America. It has also been reported as having attacked stored bulbs and other root crops, such as Dahlias, Turnips, Beet, etc. In July last I discovered this fungus attacking a crop of epicure beans at Penshurst. So far as I can ascertain this is the first time it has been found in Australia, but it should be carefully watched to prevent it from spreading.

PEACH LEAF CURL (*Exoascus deformans*).—Leaf-curl fungus is quite familiar to orchardists and cottage-gardeners during early spring, and in some seasons, especially in the months of October and November its action is most severe and causes great damage to peach crops and occasionally nectarines. In this State it has been known for many years.

It was recorded by Dr. N. A. Cobb in the "Agricultural Gazette of N.S.W." vol. iii., p. 1001-1004. The parts affected are usually the leaves but occasionally the tender-shoots are also attacked. When the leaves are attacked they become very swollen or curled and distorted and are either yellowish or reddish in colour. When the disease has reached maturity the leaves are covered with a whitish or greyish powdery-looking substance. If a small portion of this is examined under a microscope it will be found to consist of numerous minute, short, somewhat cylindrical-shaped bags or asci closely packed side by side, each of which usually contain eight spores or seeds. These little bags arise from the mycelium which permeates the tissues of the leaves or other parts affected. When the spores are liberated they are carried by various agencies on to fresh leaves where they may germinate and again cause direct infection.

In showery weather the disease attacks the trees more severely than during a dry season and when badly attacked the trees are often quite denuded of their leaves and very often the newly-formed fruits also turn yellow and finally fall to the ground before they have reached maturity.

VINE-LEAF BLIGHT OR TUFTED VINE BLIGHT (*Cercospora viticola*).—The fungus causing the disease is one of the Dermatiaceae group and attacks the leaves of the grape-vine. When the vines are badly affected the leaves are seen to be thickly-studded with copper-red coloured spots which eventually coalesce and spread over the leaves and are finally killed by the fungus. This disease has been found to infest vine leaves at Bundaberg in Queensland, by Mr. J. Keys. It was first recorded for Australia by Cooke in his "Handbook of Australian Fungi," p. 378, and also by Mr. F. M. Bailey, the Colonial Botanist in the "Queensland Botany Bulletin," VII., p. 35 (1891). It has also been recorded for New South Wales by Mr. McAlpine in his "Systematic Arrangement of Australian Fungi," p. 160. and by myself in the "Proceedings of the Linnean Society of N.S.W." XXXIV., 500 (1909). The disease mentioned by Mr. E. J. Tremayne in the "Sydney Morning Herald," December 1st, (1908), which Mr. Froggatt, the Government Entomologist, reported on and said, "shows signs of brown spots," is probably identical with this disease. As the disease progresses the tissues of the leaf in the vicinity of the spots become affected, changing to a pale green or yellow, until finally the whole leaf perishes. This blight, when prevalent, may cause considerable damage to the foliage, and consequently to the vine, but unless the season be a very wet one, it is not likely to do much damage, except, perhaps, in lower or damp situations or upon vines improperly cared for."

In 1908, I found several vines were affected with this disease at Penshurst and also at Schofields, and as the disease appeared again on the same vines in the following year they were all destroyed on account of the very poor crop of berries, which appeared to be the result of the ravages of this disease.

ENTOMOGENOUS FUNGI.—Several species of fungi are known to attack insects. The most common species found in Australia is *Cordyceps gunnii*, whilst *Cordyceps robertsii* is very common in New Zealand. These attack and kill certain Lepidopterous larvae, but in doing so, do not destroy the natural body shape. Various other species of these remarkable fungi are known to attack flies, spiders, bees and scale-insects.

THE LIFE-HISTORY OF *MILETUS HECALIUS*, MISKIN.

(By G. A. Waterhouse, B.Sc., B.E.)

THE first mention of this species is to be found in the "Transactions of the Entomological Society of London" for 1884, p. 94, when W. H. Miskin described the female collected in Victoria by Kershaw. In the "Proceedings of the Linnean Society of New South Wales," 1888, p. 1516, he described the male also from Victoria in the collection of Dr. T. P. Lucas.

The species described by Boisduval as *Lycaena* (?) *byzos* in the "Voyage de l'Astrolabe: Lepidopteres," 1832, p. 81, from the neighbourhood of Port Jackson, may possibly be an earlier name for this species. *L. byzos* has usually been considered as a synonym of *Candalides xanthospilos*, but this cannot be so, since Boisduval redescribed the latter species in the above-mentioned volume (p. 80) under the name of *Lycaena* (?) *hubneri*, as a photo of the type in the Paris Museum clearly shows. At the same time I was informed that the type of *byzos* could not be found, so it must remain as a doubtful species.

Following my capture of this fine species at the October excursion of the club to Como, I searched the suspected food plant with excellent results, and am now able to give details of the history of the species:—

Ovum.—White, about 1.3rd as high as wide, covered with short white hair-like spines, deposited singly on the underside of the leaf, or on the stalk of the plant.

Larva.—Flat, greenish, hairy, especially at the sides. The nearly full-grown larva is flat, with a slight dorsal ridge, and as is usual in *Lycaenid* larvae, the head is concealed under the anterior segments. In colour it is pale greenish or greenish-

yellow, and the hairs are very short; there is usually a tuft of reddish hairs on each segment along the dorsal ridge, and also two lateral patches of red on each segment. Shortly before pupation these reddish patches disappear. The larvae feed either just before sunset or just after sunrise, and in no case were attended by ants. They invariably ate the upper surface of the leaves, as the undersurface is very hairy. During the day time they hid beneath the leaves, close to the midrib, on a silky pad to protect themselves from the rough hairs of the food plant. When about to pupate they spin a larger pad of silk beneath a leaf, attach themselves by the tail and a silk girdle round the middle and gradually assume a more cylindrical form. After two days the larval skin is thrown off, the process taking not more than ten minutes.

Pupa.—Smooth, greenish, somewhat darker than the larva, with faint dorsal stripes on the abdomen. The day after pupation a large number of small brown dots develop over the dorsal surface. All living pupae were found beneath the leaves of the food plant, though three empty pupal skins were found on curled dead leaves beneath the food plants; these leaves probably were shed after the imagines had emerged. In captivity the larvae pupated either on the upper or under surface of the leaves, or occasionally on the side of the breeding box. The duration of the pupal stage, from the time of casting the larval skin to the emergence of the perfect insect, was in all those noted twelve days. This was in midsummer; the spring brood may possibly take longer. The wings begin to show colour a day before emergence, the colour appearing first at the outer margin. Most of the butterflies emerged before nine o'clock in the morning.

Food Plant.—*Pomaderris lanigera*, Sieb., a shrub growing to a height of 5 feet, though usually less, found in isolated localities on the Hawkesbury sandstone, near Sydney. The upper surface of the leaves is a dark green, the lower surface very hairy and slightly reddish. The young stalks are very ferruginous, and the under surface of the female butterfly bears a close resemblance to the dying yellow leaves of the food plant.

Parasites.—A Dipterous larva on several occasions emerged from the butterfly larva and pupated. From these pupae I bred a fly belonging to the genus *Miltogramma*, a typical group of the *Tachinidae*. From some pupae I bred several *Hymenopterous* parasites belonging to the genus *Chalcis*. Mr. W. W. Froggatt, who has examined the parasites, tells me that the members of the genus *Chalcis* are parasitic upon small moths and rarely on butterflies.

THE ANGLER AS A NATURALIST.

MR. C. THACKERAY'S LECTURE.

MR. C. THACKERAY lectured to the members on March 7 in the Royal Society's Rooms on the subject, "The Angler as a Naturalist." The lecturer pointed out that the angler to be successful must be a naturalist, as the original inhabitants of Australia were. If a sportsman brought to bear upon his hunting the faculty of observation as a naturalist, he would be of much more use to the community and himself than at present his class was. The hunting instinct was a human animal possession, and if allied with a feeling of sportsmanship, and tintured with the skilled observation of the nature lover, indulgence in it would be made very enjoyable. People were too often inclined to ascribe to the fickle goddess the success of certain anglers, but when that success was analysed closely, it would be found that it was the possession of the man who pitted his observing brain against the fish he sought to capture. All naturalists developed the hunting spirit. The entomologist used his net, catching-boxes and pliers, the pursuer of big game took the moving camera into the wilds to get graphic photographs of the savage animals in their native element; but the angler, equipped with rod and tackle, waders, box of flies and landing net, was even more of the sportsman than these, as his game was in its own exclusive element. Even the ornithologist with his climbing irons, nets, bird-lime and traps, found it necessary to study the movements of his quarry and then pit his brains against the creatures that moved in an element equally as inaccessible to man as the water.

The angler was unfortunately not often enough an artist, and the sea and the river in this respect were still an almost unopened book. A great field for the artist existed in the sea and river, and in the depiction on canvas with paint, or even on paper with crayons from life was a neglected section of the Australian art life. He had prepared, although not an artist, some rough crayon drawings of a few of our fish, which would, he hoped, stimulate artistically inclined members to take up in earnest the task of drawing or modelling fish from the life.

The lecturer was aided by some capital slides of fish, angling practice, and fishing resorts, lent to him by Mr. David G. Stead, Naturalist to the Fisheries' Department, and the State Tourist Department. Amongst the most interesting of these were pictures showing anglers casting with fly and bait, others seeking long beach-worms for bait, a process which

Mr. Thackeray described fully, and some very clear pictures of coastal and table-land river resorts.

After the lecture quite an interesting little discussion on the subject of art arose, and so divergent were the views expressed that the thought was suggested that someone could be induced to deliver an instructive lecture, capable of elaborate illustration by coloured plates and paintings, on the subject "The Artist and the Naturalist."

A vote of thanks was accorded the lecturer for his address.

THE HOUSE-FLY.

(By *Rex. W. Bretnall.*)

THE house-fly (*Musca domestica*) is familiar to everyone, and is distributed over the greater part of the globe.

The imago is of a uniform black colour, but has a somewhat brown appearance owing to a coating of grey tomentum. The eyes are red, and the thorax and abdomen coated with stiff black bristles; the distinguishing feature, however, is the presence of four parallel black lines on the thorax. The eggs are laid in stable manure or house refuse, and hatch out within eight hours. Professor Howard, of the United States Department of Agriculture, gives the periods of development as follows:—From deposition to time of hatching, the eggs take one third of a day; hatching of larva to first moult, one day; first to second moult, one day; second moult to pupation, three days; pupation to issuing of adult, five days. Total, ten days. A single individual lays about 120 eggs. The house-fly is a recognised agent in the spreading of diseases such as typhoid, tuberculosis, etc., and for its obliteration united action would be necessary. All garbage bins, etc., should be kept covered. Wire gauze over doors and windows forms an effective method of keeping flies out of the house. In cases where decaying matter, such as gardening manure, cannot be covered, it should be treated with kerosene or chloride of lime.

Several remedies or "checks" are in use, one of which is being found very effective in America is as follows:—A little of a saturated solution of camphor in pure carbolic acid is placed in a shallow dish over a spirit lamp. The vapour evolved is quickly fatal to flies. Mr. Froggatt recommends the following formalin treatment:—About a quarter of an inch of sand is placed in a soup plate, over which a couple of sheets of blotting paper, cut to size, are placed. Sugar is then sprinkled over the surface, and the whole saturated with dilute formalin (1 of ordinary formaline to 20 of water) and the dish placed in a well-lighted place. Flies will then be attracted

and die close around the dish. The paper is moistened from time to time with fresh formaline solution.

An effective trap is made by placing a little mixture of honey and vinegar in a tumbler, and making a paper funnel to the fit the mouth of the same. A hole is then punched in the end, and the funnel placed in position, so that the hole is a little above the liquid. Flies will then swarm in through the hole.

Another and yet simpler method is to half-fill a number of tumblers with soapy water, over which a piece of paper, smeared on the undersurface with honey or treacle, should be tied. A hole in the centre of the paper forms an entrance through which the flies will swarm.

NOTES AND COMMENTS.

ASYMMETRY OF THE CETACEAN SKULL.—Frederick Houssay, in *Anat. Anzeig*, Vol. XXXVI., 1910, expounds an ingenious theory, similar to Kirkenthal's, as to the origin of the asymmetry in the cetacean skull. The primitive Cetacean is supposed to have had a tendency to roll round on its axis; the flippers counteract this; the result is dissymmetrical pressure on the head, and this brings about a deformation of the skull.

NEW ZEALAND JADE.—The largest specimen of jade known in any museum in the world is that in the American Museum. It was found in 1902, and weighs three tons, measures seven feet long and four feet wide, and, in fact, is the largest mass of jade, of which we have any record, that has ever been brought to civilised lands from anywhere. One of the greatest previously known is that in the British Museum, and the second largest piece known, which was found by Mr. G. F. Kunz in 1899, came from Silesia. This latter specimen is also deposited in the American Museum. Maori ornaments made of jade (green-stone) are well known. The largest deposits of this stone are found on the west coast of the South (Middle) Island at Milford Sound, in boulders associated with, and presumably found in, a rock-matrix of chlorite schist. The boulders appear in the mountain streams and usually range in weight from a few ounces to fifty or sixty pounds. In composition it is a silicate of lime and magnesia. It is a trifle less hard than quartz, but from its matted, felt-like structure is of extreme toughness, thus requiring much more manipulation to shape or polish than does quartz or agate. Much New Zealand jade has been worked into Chinese art objects, but the greater part of the material used in China, whether green or white, came from the Kuen-lun Mountains in Turkestan, south of Khotan. No white jade has ever been

discovered in New Zealand, and no jade has ever been discovered in China proper, although all the worked articles from that Empire are referred to as "Chinese jade." For the Chinese, jade symbolised all that was high and pure. Kwan Chung, in the seventh century before Christ, wrote that its smoothness symbolised benevolence; its brilliant lustre, knowledge; its toughness, justice; its rarity, purity of soul. That the smallest crack on its surface was immediately visible typified candour, and the fact that although passing from hand to hand it was never soiled made it a symbol of a life governed by high moral principles.

FOSSIL EGGS.—An egg that is two feet eight inches long, and two feet two inches round, and that has a capacity of about two gallons, has recently come into the possession of the American Museum. The specimen is a fossil from Madagascar, and had been in the British Museum on loan since 1892. It is unusually perfect, the shell unbroken, although finely pitted in places. Seeing that it had lain so long in the latter institution, it is a pity that it was not secured for it, more especially as the price paid by the Americans was only 100 dollars. Fossil eggs of this description first came to the notice of scientists in 1850; these were discovered in the bed of a torrent in Madagascar. The natives were familiar with them, using them sometimes as vessels for domestic purposes; and these natives also had a tradition of a bird large enough to carry off an ox. At the time of the discovery there was much discussion by scientific men as to whether what came out of these eggs in ancient times was bird or reptile, and after a few bones discovered somewhat later, decided in favour of bird, which was named *Aepyornis*, there was much difference of opinion as to its kind and relationship. Some placed it with dodos, others with auks, and still others with vultures or large birds of prey. Some fifteen years later, in 1867, various less incomplete fossil remains came to light, which decided definitely that the bird was not only of massive proportions, but also that it was short-winged, thus proving its alliance to the *Dinornis* of New Zealand, and to the *Apteryx*. Its height was supposed to have been six or seven feet, although previous calculations had placed it at twelve feet.

BUTTERFLY NOTES.—During the end of March a fair number of specimens of certain *Pieridae* have been observed flying from north to south. These will probably increase in numbers during April. The species observed were *Catopsilia pyranthe*, *C. lactea*, and *Terias smilax*. A larva of *Junonia villida*, Fabr., found upon *Plantago* pupated on March 3rd, and the imago emerged on the 13th of the same month. Several other specimens of the same species remained during the period quoted in the pupal stage.—G. A. WATERHOUSE.

LINNEAN SOCIETY OF N.S. WALES.—Mr. W. W. Froggatt⁺, F.L.S., ex-president of our Club, has been elected president of the Linnean Society of N.S. Wales in succession to Mr. C. Hedley, F.L.S., who occupied that position for two years. The last-named gentleman is also an ex-president of the Naturalists' Club.

CURRENT LITERATURE.—Part 4 of vol. xxxv. of "The Proceedings of the Linnean Society of N.S. Wales" was issued on March 1, and contained much matter of interest. Mr. Arthur M. Lea, F.E.S., contributed a paper on "Australian and Tasmanian *Pselaphidae*," and illustrated it with a plate. This paper contained interesting notes on previously recorded species, besides descriptions of some new forms. "An Additional Note on the Birds of Lord Howe and Norfolk Islands" appears under the name of Mr. Tom Iredale, whilst Mr. A. Basset Hull contributes another (also illustrated by four plates) entitled "Further Notes on the Birds of Lord Howe and Norfolk Islands." The last-quoted paper contains the description of a new species of Petrel, for which the scientific name of *Oestrelata montana* is proposed, and as a popular name, "Lord Howe Petrel." Messrs J. H. Maiden and E. Beteche continue their "Notes from the Botanic Gardens, Sydney"; whilst Dr. R. Greig-Smith contributes two important papers on bacteriological research. Mr. T. G. Sloane in his paper, "*Carabidae* from Dorrigo, N.S.W.," gives a list of species collected by Mr. Carter and himself during a trip to that interesting locality, together with description of some new species; to this paper Mr. J. H. Carter, B.A., F.E.S., contributes an appendix: "*Tenebrionidae* from Dorrigo," and this part also contains a list of species collected and descriptions of new forms, illustrated by text-figures. By Mr. W. M. Carne there is a "Note on the Occurrence of Limestone-flora at Grose Vale"; whilst Mr. R. J. Tillyard, M.A., F.E.S., has a paper "On Some Remarkable Australian *Libellulinae*." This paper forms part iii. of this series of contributions, and contains "Further Notes on *Camacina Othello*, Tillyard," and is illustrated by fig. 3 on pl. xvii. "Notes on Fruit-Flies (*Trypetidae*) with Descriptions of New Species," is the title of paper by Mr. W. W. Froggatt, F.L.S. The concluding paper in the interesting "budget" is by T. Thomson Flynn, B.Sc., and is entitled "Contributions to a Knowledge of the Anatomy and Development of the Marsupalia," No. 1.

NOISES MADE BY SNAIL ON WINDOW-PANE.—Fréd. Vlès (Bull. Soc. Zool. France, Vol. XXXIV., 1910) discusses this problem, in regard to which there is considerable difference of opinion. His observations lead him to conclude that the grating noise is due to the shell, not to the radula, and that there is another rarer noise of unknown origin, like that made by the bursting of a large bubble on the surface of water.

THE
Australian Naturalist.

VOL. II.

JULY 4, 1911.

PART 7.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETING.—The ordinary meeting of the Club was held at the Royal Society's House, on Tuesday, April 4, 1911, the President, Mr. W. B. Gurney, F.E.S., in the chair.

NOMINATIONS.—Mr. S. E. Rohu, Miss Liggins, and Mr. W. B. Brown; country member, Mr. A. Warner.

LECTURE.—Mr Le Soeuf, Director of the N.S.W. Zoological Gardens, gave a lecture on "Zoo Life." The lecture was an extremely interesting one. The lecturer showed by means of lantern slides the modern effort to exhibit animals, as far as possible, as they would be in their native environment. He also exhibited admirable slides showing the value of their coloration as a means of protection.

EXHIBITS.—Perhaps the most interesting exhibit ever shown at a meeting of the Club was a live platypus sent by Mr. Le Soeuf; the exhibit created great interest; Mr. Wickham showed some most interesting entomological exhibits; Master Oliver Edwards showed a fine specimen of *Papilio Aegeus*.

ORDINARY MEETING.—The ordinary meeting of the Club was held on Tuesday, May 2, 1911, the President, Mr. W. B. Gurney, F.E.S., in the chair.

NOMINATIONS.—Mr. Harry Grace proposed Mr. Edwards, seconded by Mr. Finckh.

ELECTIONS.—Mr. S. E. Rohu, Miss Liggins, Mr. W. B. Brown and Mr. A. Warner—a country member.

BUSINESS.—Lecture by Dr. H. I. Jensen on "The Making of Eastern Australia."

ORDINARY MEETING.—The ordinary meeting of the Club was held on Tuesday, June 6, 1911, the President, Mr. W. B. Gurney, F.E.S., in the chair.

NOMINATIONS.—Miss McMurtrie, proposed by Miss Mabel Brewster, seconded by Miss Brewster.

ELECTION.—Mr. Harry Grace.

EXHIBITS.—Fish—Blue-eye—obtained at the Easter excursion by Mr. D. G. Stead; a small ground trout, and a

lamprey. Mr. Le Soeuf exhibited a singularly beautiful green lizard—*Naultinus elegans*—from the North Island of New Zealand; it is an exceedingly rare reptile, and is fast disappearing; also a large carnivorous land snail—*Paraphanta busbyi*—from North Island, New Zealand; also a wingless carnivorous cricket—*Hemidina thoracica*—from North Island, New Zealand. These exhibits proved of great interest, and attracted much attention. Master Oliver Edwards—collection of beetles, etc., collected at Wamberal.

LECTURE.—The Rev. W. W. Watts, M.A., delivered a most interesting lecture on "Mosses," and illustrated his subject with excellent diagrams and some hundreds of exhibits consisting of Mosses not only from Australia, but different parts of the world.

LECTURE ON MOSSES.

[Rev. W. W. Watts, M.A.]

At the last monthly meeting the Rev. W. W. Watts gave a lecture on Mosses. The following is a synopsis of the lecture:—Mosses were Cryptogams. The Cryptogams were not "flowerless"—all the mosses had flowers; neither was it altogether true that cryptogamic flowers were invisible to the naked eye, the male flower of many mosses was quite visible without even the aid of a lens. The distinctive character of the Cryptogams was that they were propagated by spores, and that they were characterised by "alternation of generations," which meant that the life history of the Cryptogam exhibited two distinct and successive plant-forms—the form that bore the male and female flowers (called the first, or sexual, generation) and the form that produced the spores (the second, or asexual, generation). The spore, when in contact with the moist ground or other substratum, expanded, in the case of the Ferns into a minute film, called the prothallium, and in the case of the Mosses into, for the most part, a threadlike growth, called the Protonema. In the case of the ferns, the prothallium bore, on its underneath surface, the flowers, and this constituted the first generation; and out of this sprang the fern as we saw it with the naked eye—the spore-bearing plant, or second generation. In the case of the Mosses, the plant as visible to the eye bore the flowers, while from it there grew up a separate form topped with a capsule that bore the spores. The plant itself sprang up from a joint in the protonema.

The Mosses were *cellular* Cryptogams, and as such possessed remarkable tenacity of life, and exhibited many beautiful variations of structure.

The Moss plant ranged from minute forms barely visible to the naked eye up to very large forms like *Dawsonia superba* or *Spirideus muelleri*, the latter of which had been collected by Mr. Whitelegge on the top of Mt. Gower, in Lord Howe Island, two feet or more in height. A silky pendulous moss (*Barbella trichophoroides*) he himself had seen in the Richmond River scrubs growing fully three feet high.

The stem varied greatly, not only in length, but in character. It might be circular, bearing leaves all round without any noticeable order, or triangular, bearing leaves in three rows, or might take other shapes: the leaves being frequently set in straight or spiral rows. The inflorescence possessed the characters exhibited in Phanerogams: it might be dioicous or monoicous. But "monoicous" was not used in modern descriptions of mosses, because the monoicous inflorescence appeared in different forms. It was therefore described as "synoicous" (the male and female flowers in the same bud), "paroicous" (the male flowers alongside the female bud), "autoicous" (the two kinds of flowers being on different parts of the stem), and "heteroicous" (more than one of the foregoing forms being present). Where the inflorescence was both dioicous and monoicous, it was called "polyoicous."

The leaves were as varied in form and structure as those of the Phanerogams; they were entire or serrate, bordered or unbordered, and were marked by many other beautiful characters: the cell formation was particularly interesting and varied.

The second, or spore-bearing, form was intensely interesting. It consisted of a stem (seta), short or long, variously coloured, etc., tipped by a capsule, which held the spores. Mr. Watts described the growth of this "sporogone" (or second generation), and showed how the spores were arranged and how they were set free. The capsule generally was shut by a lid (operculum) and crowned with a hood (calyptra). When the operculum was removed, in many species a beautiful circle (single or double) of "teeth" was disclosed, called the peristome, through and by which the ripened spores were omitted. Finally Mr. Watts spoke of the great variety of the spores in colour and consistency.

Throughout, the lecturer illustrated his points by reference to specimens and to a fine diagram borrowed from the Sydney Herbarium.

Mr. Watts also referred to the question of Moss distribu-

tion, his experience going to support Mr. C. Hedley's theory of the direction of the streams of plant-life in the Pacific.

After his lecture Mr. Watts passed round a large number of mounted specimens from New South Wales, New Zealand, the Pacific, Europe, etc.

In response to the request of the President, he also gave a few hints as to the best way of collecting and preserving specimens of mosses, and offered to name any specimens collected by members.

THE EASTER CAMP.

[Budget of News Compiled by C. Thackeray.]

A dust trail out and a slough of despond back—those were two of the outstanding features of the Easter Camp at Wamberal, eight miles east of Gosford, in which members of the New South Wales Naturalists' Club, the Aquarium Society of New South Wales and the Floral Society of New South Wales, to the number of 58, participated this year. It was a big camp, and the eternal "tucker" problem on Good Friday was something to be remembered. However, owing to the heroic exertions of Mrs. H. E. Finckh, Mrs. D. G. Stead, Miss Beaumont, and a host of other willing ladies, the problem ceased to present difficulties and obtruded itself no more. Everybody fed like fighting cocks, and got through without any perceptible loss of *avoirdupois*.

The camp was certainly rather an unwieldy proposition, but it brought out the latent camp-craft of many of the men, who showed their faculty for overcoming difficulties and who fixed up their tents and bunks with an eye to possible changes in the weather. At first the party was favoured with ideal weather, a little bit on the chilly side at night; but during two days and nights Undine wept beside the fountain, and some of the campers had to go into the houses secured for the accommodation of the ladies, where they found the flooring of the dining and sitting rooms at least dry—if hard. Some of the sufferers from the hard floor are still feeling sore and sorry that they did not rig up their bunks—but they have learned their lesson, and, being young, may profit in future.

There were two well-known journalists in the party, so everybody was on his or her best behaviour—even those who agreed to the suggestion that a fitting rhyme for dust was cuss'd.

The leaders in various sections of natural history study were Messrs. W. B. Gurney (President Naturalists' Club), E.

Cheel (President Floral Society), David G. Stead (President Aquarium Society), S. J. Johnston, B.Sc. (Sydney University), and L. Harrison (Ornithologist). These were all kept busy during the four days at Wamberal and Terrigal, and the collecting gear of the party was continually requisitioned. Many fine specimens in various departments of nature study were secured, and the trip may be set down as a valuable, and at all times, an interesting experience.

Mr. Stead used a fine net to sieve the lake, and found some flounders, hardiheads and other marine creatures, and showed how dexterously a flounder could efface itself in a sandy pool by a lateral action which threw sand particles over its body. He also explained that one could pick out young hardiheads from young mullet by the dorsal fin. In the mullet the dorsal fin had four rays.

Mr. E. S. Edwards, M.A., found under the bracken near the beautiful Australian cotton-bush some cocoons of the introduced Wanderer butterfly (*Danaus menippe*), and had some of the cocoons develop into butterflies in his tent. "It has a definite and easy flight," said Mr. Edwards, "and is not a pest."

The horror of a marine tragedy witnessed by a young lady member deserves to be recorded. The attacker was a richly-coloured five-pointed starfish, which advanced with felonious intent upon a harmless chiton which shut its scutes tightly and clung to the rock with a suctorial pressure equal to about 28 pounds, and resisted the murderous starfish passively. It was a one-sided struggle, and the lady who watched it did so as if mesmerised. The inexorable irritating pressure upon the chiton caused it to let go its hold; and the starfish was just preparing to absorb its white flesh when the fair witness interposed. She secured both despoiler and despoiled, and placed the two in her collection. It was one of those happenings which rarely falls to the naturalist to witness, but the party was singularly fortunate in that respect.

Mr. L. Gallard, of the State Insectarium at Narara, was amongst the party, and he brought from the establishment several studies of the life history of various fruit flies, which Mr. Gurney subsequently explained. Collectors often have difficulty in getting suitable pinning boards for beetles, flies, and butterflies, owing to the cork supply running out. Mr. Gallard solved this problem capitally by utilising the dried stems of the cactus for the purpose. These, when grooved for the reception of the bodies of specimens, afforded a good hold for the pins used to display wings.

As the naturalists began to settle down to collecting, their excursions covered more country, and their special carrying

apparatus to become filled. Bottles of dilute formalin soon held a multitude of specimens, and botanical presses began to creak with a wealth of growth torn from their native heath. A sectional party under Mr. S. J. Johnston went away into the bangalow scrub and returned with birds, botanical specimens and parasitical forms of life of more interest to science than to the general public. Later on a second party of botanists and entomological students broke into the luxuriant bell-bird scrub, and, while the dainty feathered creatures sounded their cheerful notes, which echoed like the silvery tinkle of tiny bells of exceptional quality, sought for wonders of the forest.

Messrs. E. Cheel and W. B. Gurney led this excursion, and the party was soon busy amongst the young bangalow and cabbage tree palms, and the various thorny shrubs which the ordinary bushman calls "lawyer," but for which the botanist has a dozen or more names. A few torn garments resulted from encounters with the lawyer vines and shrubs, but naturalists are superior to little troubles of that character, and there was not a hobble skirt or even a fashionable blouse to be sacrificed, although plenty of attractive dresses were worn after field work was over.

Some of the party were anxious to discover scrub leeches, but the leeches discovered them first. Four of the men found the creatures fastened to their legs, when a couple had commenced their blood-sucking operations. The leeches that thus endeavoured to get even with the explorers who broke into their domain went into the formalin bottles without a requiem hymn. None of the party have nerves where insects are concerned. In one of the bedrooms occupied by two ladies a community of paper-nest wasps had built their habitation, and all day long slew spiders and conveyed them to their storehouse. They were friendly eyes that gazed upon the operations of the wasps, and apparently the venomous creatures knew it, for they stung no one.

Mr. Cheel found a fine specimen of the Jew's ear fungus (*Hirneola auricula-judea*) growing on a dead log. This fungoid growth is only found, like the lichens, growing luxuriantly in pure air which gets the tang of the salt sea about it. Its greatest habitat is the South Sea Islands, where it is collected and sold to the Chinese at high rates per pound for the making of some of their expensive and mysterious soups. Mr. Cheel expressed the opinion that plenty of these fungi could be obtained in this State.

Another discovery was some eggs of the active lizard (*Egernia whiteii*), a reptile named after a great naturalist who specialised in lizards. The eggs were kept in a bottle, and

distinguished themselves. One broke open while being carried back to camp and let his captive out. Two others emerged from the egg the following morning in full view of a score of nature students. Such a rare occurrence to fall to their lot to witness was rightly regarded by all as an extraordinary one, evidently specially arranged for their benefit. The little lizards were fully equipped for their forest life directly they came out of the eggs.

"Mr. Gurney's leaf insect has laid an egg," said an excited young member one morning. The breakfast eggs and porridge were forgotten at once, and attention was concentrated upon a little brown ovate body with a white maltese cross sculptured upon it which a green leaf insect had laid. Shocked by the prying eyes the insect hunched up her leaf-like legs and curled her body to resemble a twisted eucalyptus leaf, but nobody hurt her. Indeed, one member of the party wanted to let her go free for her exploit, but Mr. Gurney protested, as he wished to observe its food-plant in the State Herbarium at Narara.

It was said that Mr. Gurney would not release it for pounds, and to judge by the earnestness and energy of this worker in scientific fields, nothing small escaped his notice if it did anything out of the common. A huge mosquito found that out to her cost—it is only lady mosquitoes which attack humanity. She ventured into his tent and was discovered on the wall. In a trice she was secured and placed in the killing bottle.

After the excursions for the day Messrs. Gurney, Stead, Johnston, Dr. Griffith, Cheel, and other leaders spoke enthusiastically of the thoroughness of the work of the collectors. They were kept busy till a late hour identifying insects, plants, etc.

Mr. Horan made a great find. It was supposed to be a bora or boora tree, and it was only five minutes' walk from the camp. These trees are marked with designs of boomerangs, spears, etc., and usually occupy a cleared place where the aborigines carry out the mystic ceremony of admitting boys to manhood. This particular tree was a bloodwood gum, and while it may not have been a bora tree, it was certainly an aboriginal record. From branch to base it was scarred with rough representations of the boomerang. In the opinion of one member of the party it was at any rate a place of record of some chief.

Geologically, the trip had great interest. Apart from the outstanding feature of the Terrigal skillion, which, it was explained by Mr. McDonough, is a striking example of an outcrop of the Narrabeen shales, the Gosford district is a rich ground for the student. South of Terrigal is Bulbarar-

ing, where a series of coastal marine potholes is found. Each of these is a marine aquarium in itself. Bulbararing Lake is being renamed Moore Lake, another evidence of the incapacity of the modern to appreciate appropriateness of musical aboriginal names. The Gosford district has geologically achieved renown. It was a quarry not far from the township of the sleepy shire council that a complete fossil specimen of the extinct reptile *Labyrinthodon* was discovered. This was a huge lizard of the mesozoic period, and when the fossil was unearthed it was secured for the British Museum. Before it was despatched to the old country, however, a cast of it was taken, and is now in the Australian Museum. One of the lady members of the party secured some fossils from the shales at Terrigal for investigation later on. A lecture was to have been given by Mr. Briggs on the scene, but the copious rain of Sunday and Monday interfered with this portion of the programme.

A singing moth was captured at night. It was an active mover, and a ceaseless singer that emitted a sound like a diminutive creak of one of the Cicadidae. It made a rapid circular flight, and was very difficult to capture, but there are few flying things able to elude the net of the entomologist. A dexterous sweep—and the singer's note was ended.

Half a dozen enthusiasts who dared the heavy storm clouds to shed their moisture upon them went to Bulbararing and returned soaked to the skin. They found the best fields for observation unapproachable on account of the heavy sea, but the botanists among them were pleased with the lavish display of the red fruit of the *Macrozamia*—the palm with which most people of the towns of the coast are familiarised on Palm Sunday. This beautiful palm is a Cicad—the oldest form of vegetation found in the coal measure. The red, fleshy, astringent envelope covers a hard nut in which is a white kernel. From this kernel Messrs. R. T. Baker and Smith, of the Technological Museum, have made a very fine arrowroot. So luxuriantly was the *Macrozamia* fruiting that the thought was impelled that it might be cultivated on a commercial scale. The seed after it falls upon the ground gradually loses its tough skin and the hard shell beneath it is exposed to the elements, which it resists for a long time. Under the influence of excessive heat, such as is afforded by a bush fire, the shell of the nut is calcined and the interior has an opportunity of reaching the parent soil.

The rain ended most of the planned excursions, and these had to be cancelled in favour of indoor classifying, the fixing and mounting of specimens, and amusements. Surf and lagoon bathing naturally filled in some of the time, and part of

the night was whiled away pleasantly owing to the acquaintance with some of the poets possessed by members.

The ornithological usefulness of the excursion was discounted by the shooting that went on through the district. To do really effective work, the bird-student must have the birds at peace, and the Wamberal birds were far from being in that blissful state. Not half the number of species of the original winged occupants of the district were seen. It was noted that the bell-birds kept to one locality, a fact explained by Mr. L. Harrison as being due to the honey food of the birds being mainly confined to that area. A few parrakeets and three kinds of land and marine eagles were observed. The laughter of the goburra was only rarely heard, but the butcher bird's mellow call round the camp was a welcome change. Terns, leather-heads, kingfishers, goburras, and a few other birds were noted. Everything, however, ended happily, although some of the party had to drive back to Gosford in open vehicles in the rain, which gave them an opportunity of expatiating upon the Erina Shire Council's most cherished tourist attraction—next to the dust—namely, its mud. Thus the party left the bell-birds, the flowering paper-bark melaleucas, and the roar of the surf, and safely reached the city after four days of highly successful collecting.

MODERN ZOOS.

[*Abstract of Lecture by A. S. Le Souef.*]

It is very satisfactory from all points of view to note the radical changes that have taken place in the treatment of animals in captivity during the last few years. Carl Hagenbeck, of Hamburg, a man who had the comfort of the wild things thoroughly at heart, and with a genius for designing proper inclosures for them, was chiefly responsible for altering the whole design of a Zoological Garden; the basis of his plan was fresh air and natural surroundings. It was found from practical experience, that even in Europe, many tropical and temperate climate animals did better without artificial heating, and that absolutely fresh air was very necessary for their health and well being. With this as a starting point it became possible to do away to a great extent with houses, and the shelter compartments were built just large enough to keep the inmate dry and warm, while outside this a large enclosure giving ample space for exercise in the open. Further development took place in the endeavour to make these enclosures simulate the animals' natural environment. The greatest triumph was achieved with the larger Carnivora, and

the bold plan was adopted of placing these on view without bars intervening, the barriers being walls and moats. Bars spell captivity, and it is indeed a great advance to be able to show these noble animals without them.

A start has been made in keeping the animals on these lines in the Sydney Zoo; but the exposed position of the gardens, the small area and the ceaseless noise and dust from the traffic, together make very unsuitable conditions in which to maintain a Zoo, and before going further the Council are endeavouring to secure a spot which is suited to the purpose, and which will enable them to keep their interesting and valuable collection under the best possible conditions.

Numerous pictures of the new class of enclosures were shown.

PRESERVATION OF HERBARIUM SPECIMENS.

The "Report of the Department of Agriculture," Victoria, 1907-10, contains that of the Government Botanist, which deals, among other things, with the results of experience at the National Herbarium, Melbourne, in the matter of the preservation of herbarium specimens from the attacks of insects.

The most successful method of preservation has been found to be the use of camphor, in tightly-fitting cupboards. This is stated to be more effective than periodical exposure to the vapour of carbon bisulphide. The objection to the latter insecticide is that it does not penetrate large parcels of plants sufficiently thoroughly to destroy all the grubs in them during the maximum time, namely, three days, that they may be exposed in the poison chamber; such parcels simply reinfest others when they are returned to the herbarium. The cost of the methods is about the same as regards material, but circumstances in favour of the use of camphor are the smaller amount of time and labour that are involved by its employment.

It is pointed out that specimens will last all the longer if they are handled as little as possible. A useful precaution that has been employed, whenever reference has been made to specimens, is to poison any that show signs of insect infestation, with an alcoholic solution of mercuric chloride similar to that which has been recommended for use in connection with the preservation of books in the tropics. The importance of such a precaution in a herbarium containing large numbers of type specimens, is easily understood.

"THE MAKING OF EASTERN AUSTRALIA."

DR. H. I. JENSEN lectured to the Club on Tuesday, May 2nd, on "The Making of Eastern Australia." The lecture was part of a monograph on this subject which it is the intention of Dr. Jensen to publish shortly. He traced the gradual geological growth of Australia, and drew special attention to the contour and characteristic rocks of Eastern Australia. The lecture was illustrated with a large number of interesting lantern slides and diagrams.

EXCURSIONS.

THE excursion to Bexley on Saturday the 11th March proved a distinct success. Members left Sydney by the 10 past 2 train for Arncliffe and took tram from that station to Bexley. The members of the Flora Society joined with us in the afternoon's collecting, and the long gully which commences at Bexley and works down into a deep valley towards Tempe proved an excellent hunting-ground. Many interesting beetles—*Paropsis* was particularly plentiful—and flowers were collected. The larvae of the Cup Moth were much in evidence on the Eucalypts. About 4.30 the members of the party adjourned to Mr. D. G. Stead's home at Bexley, where Mrs. Stead entertained them most hospitably at afternoon tea. Mr. Stead showed the visitors many interesting exhibits of Crustaceans and other objects of natural history, and then photographed the party. The kindness of Mrs. and Mr. Stead were greatly appreciated, and a vote of thanks to them was carried with ringing cheers.

THE monthly excursion was held at Fig Tree, Lane Cove River, on 6th May. There was a very large attendance of members, and, considering the lateness of the season, a fair number of specimens was obtained. Some two hours were spent in collecting, and while the billy boiled Mr. W. B. Gurney and Mr. Cheel named and described the entomological and botanical specimens respectively which had been collected.

THE excursion on Saturday, 10th July, was held at Clifton Gardens. The leaders were Mr. Gurney and Mr. D. G. Stead. Mr. Stead drew special attention to the evidences of recent uplift in the rocks evidenced by the presence of shellfish which can only live in the water and which are affixed to the rock several feet above high water mark. The short afternoon prevented any very extensive collecting.

NOTES AND COMMENTS.

APPOINTMENT.—Mr. A. M. Lea, F.E.S., has resigned the office of Government Entomologist, Tasmania. He will shortly enter upon the duties of Entomologist to the South Australian Museum, to which position he has been appointed.

RETIREMENTS.—Mr. C. French, F.L.S., has been retired from the position of Government Entomologist, Victoria. He is succeeded by his son, Mr. C. French, junr. Mr. J. G. O. Tepper, who has for many years filled the position of Entomologist to the South Australian Museum, will shortly retire from that office.

LINNEAN SOCIETY.—At the last meeting of this Society, the exhibits were, as usual, exceedingly interesting. Mr. Gurney exhibited a complete series of specimens illustrating the life-history of an indigenous Braconid wasp (*Opius tryoni* Cameron), a parasite of the Queensland Fruit-fly (*Dacus tryoni*)—the first parasite of fruit-flies recorded from Australia. He showed also a specimen of the wasp bred from one of two larvæ of the introduced Mediterranean Fruit-fly (*Ceratitis capitata*) in a peach—the first and only case of this association which had come under his notice. The Queensland fruit-fly is known to attack four kinds of native fruits, and is now taking to Citrus-fruits. The wasp has only a fluctuating value in checking its natural host at present; but if it can be encouraged to give more attention to the introduced host, it may render most useful service to fruit-growers. Mr. A. R. McCulloch exhibited, by permission of the Curator of the Australian Museum, specimens of *Leiuranus semicinctus* Lay and Bennett, and *Canthigaster bennetti* Bleeker, which he had collected at Murray Island, Torres Strait. Neither of these fishes appears to have been previously recorded from Australia, though both are well known from the East Indian Archipelago and the Pacific Ocean. Mr. Froggatt exhibited specimens of the Kurrajong Star-Psylla, *Tyora sterculiæ* Froggatt, upon a pot-plant, showing the curious filaments produced by the larvæ on the leaves. Also specimens of parasitic Hymenoptera, in illustration of Mr. Cameron's paper. Mr. North exhibited a series of skins of the Plumed Bronze-wing, or "Spinifex Pigeon," *Lophophaps plumifera* Gould, from various localities in North-western Australia, Central Australia, Northern Queensland, and South Australia; whilst Mr. Cheel displayed a very interesting series of specimens of West Australian species of *Persoonia*, from the National Herbarium, by permission of the Director. Likewise, on behalf of Mr. Ernest J. Bickford, fresh flowering specimens of *Chamoelaucium uncinatum* Schau, from a plant introduced two years ago from Geraldton, W.A., where it is commonly known as Wax-Plant.

THE
Australian Naturalist.

Vol. II.

OCTOBER 3, 1911.

PART 8.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

Ordinary meeting of the Club, Royal Society's House, 4th July, 1911, the President, Mr. W. B. Gurney, F.E.S., in the chair.

Following were nominated for membership:—Miss McIntyre, Miss Gladys McIntyre, Miss Campbell, Miss Bell. Messrs. C. H. Wickham and A. S. le Souef were appointed auditors.

A short address was delivered by Mr. Cheel on "Beans and their economic value."—Mr. Froggatt, in drawing attention to the recent work on "Australian Birds," by Messrs. A. H. S. Lucas and Dudley le Souef, entered a protest against needless alteration of popular names. An article by Mr. Froggatt on this subject appears in the present issue.

Mr. Stead exhibited fine specimens of Ox-eye fish and John Dory, and gave some interesting particulars regarding them. The President showed a number of interesting microscopic objects.

Ordinary meeting, 5th September, the President, Mr. E. Cheel, in the chair. Dr. Mjoberg, of the Swedish collecting expedition now in Australia, was present as a visitor, and was cordially welcomed by the President.

A letter from the Aquarium Society, requesting the co-operation of the Club in making joint representation to the Government for the erection of an aquatic house in the Botanic Gardens, was read. After discussion it was resolved that the matter be referred to the Council for consideration. The following nominations for membership were received:—Mr. H. S. Milne, Mr. J. Kellick, Miss Pattinson, Miss Brown, Miss Reilly, Miss Clark and Miss Phillips, B.A. The persons nominated at last meeting were unanimously elected members. A most interesting lecture by Mr. A. G. Hamilton, on the "Fertilization of Plants," was delivered and illustrated with numerous very fine slides.

ANNUAL MEETING.

The annual meeting was held in the Royal Society's House on 1st August, the President, Mr. W. B. Gurney, F.E.S., presiding over a crowded audience. After the usual formal

business, the following were nominated for membership:—Messrs. Joseph Miller, R. K. Spencer, John Shirley, B.Sc., M. Carne, and Master L. Ducker.

The annual report of the Council, which is printed in the present issue, was read and adopted, as was the Hon. Treasurer's statement. The office-bearers, as stated in list in its usual position on the cover, were duly elected for the ensuing year.

Mr. Gurney suggested that in view of the similarity of interests amongst the members of several of the Sydney popular scientific societies, notably the Flora, the Aquarium and, perhaps, the Wild Life Preservation, it would consolidate the work of these societies and do away with overlapping if amalgamation into one strong society could be arranged. The recent combined Easter excursion was so eminently successful as to encourage him to hope that a practical basis of amalgamation could be arranged. Perhaps a beginning might be made with a combination of the Flora and the Naturalists.

The retiring President delivered his Annual Address, which was on "Aquatic Insects," and was illustrated by a large series of fine lantern slides, and of living specimens by means of the microscope projector. The new President, Mr. E. Cheel, having been introduced by Mr. Gurney, took the chair, and returned thanks for the honour of his election. The meeting terminated with the usual exhibition of specimens.

ANNUAL REPORT.

THE year has proved an extremely successful one in every way. The attendance at the meetings has increased, and the monthly excursions have proved remarkably popular. The attendances at these excursions varied from 25 to almost 50, and much good work was done under the guidance of the various leaders. Twenty-two new members were added to the roll, and six members resigned, while the subscriptions for the year constituted a record for the Club.

The thanks of the Club are due to the following gentlemen, who lectured to members during the year, viz.:—Mr. G. A. Waterhouse, B.Sc., F.E.S., Mr. W. W. Froggatt, F.E.S., Mr. E. Cheel, Mr. L. Harrison, Mr. T. Steel, F.L.S., Mr. C. Thackeray, Mr. A. S. le Souef, C.M.Z.S., Dr. H. I. Jensen, Rev. W. W. Watts. A synopsis of these lectures appeared in the Club journal.

Two special excursions were held during the year, one at Cronulla in November, where about thirty of the members

spent the week-end, and did some valuable collecting; the other at Easter, when the members camped at Wamberal. This was a very great success, and the four Easter holidays were spent in various excursions in the neighbourhood of one of the most beautiful localities on the New South Wales coast. So successful were these excursions that we look forward to others during the coming Summer.

The Council of the Club organised the Science Section of the Girls' Realm Guild at the Sydney Town Hall, and the lecturers were members of the Club.

Mr. Cheel was elected Librarian during the year, and is now cataloguing the books and thoroughly organising the Library.

Mr. W. J. Rainbow resigned the position of Editor of the Club Journal, and his resignation was accepted by the Council with extreme regret. For many years he has edited the Journal with conspicuous success, but increased pressure of work compelled him to relinquish the work. Mr. T. Steel, F.L.S., was elected to fill the position.

EXCURSION TO ZOOLOGICAL GARDENS.

ON Saturday, 8th July, the members went to the Zoo., on the invitation of the Director, Mr. A. S. le Souef. The visitors, of whom there was a large party, were met at the gate by Mr. le Souef, who personally conducted them round the gardens, and in a most interesting manner imparted a great amount of information. The first item to be brought under our notice was a comparison of a number of skins of the common "opossum," *Trichosurus vulpecula*, showing variation due to environment. Skins of this animal, introduced 23 years ago to New Zealand from Tasmania, now have the fur long and hairy, and of a distinctly blacker colour than is the case in Tasmania, where the fur is dense and woolly, and more valuable commercially.

In the marsupial section of the gardens, living examples of the Great Red Kangaroo, *Macropus rufus*, were pointed out, illustrating the change in colour due to the animals having been brought from their natural habitat in the interior of New South Wales. In their native haunts, these creatures are of a bright tawny red colour, which under the greener and moister conditions of the Sydney gardens soon changes to a sombre grey, the red tint disappearing. A sub-species, *Var. occidentalis*, occurring in the dry, sandy North-West of Australia, is coloured a brighter red still than the New South Wales form.

It is interesting to note, too, that in captivity various

marsupials have a decided tendency to throw white offspring, and that these will breed true; cases in the Gardens have occurred in the Red Kangaroo, the Nail-tailed Wallaby (*Onychogale unguifera*), and the Vulpine Opossum.

Very curious local variations in the skin pattern of the Carpet Snake (*Python variegata*) were pointed out by Mr. le Souef, the marking being less definite in specimens found in the vicinity of Sydney than in those occurring along the northern coasts and highlands. It is Mr. le Souef's intention to bring the results of his observations before the Linnean Society of N. S. Wales, and from what the visitors saw on this occasion there can be no doubt that his paper will be most interesting and valuable.

It was explained that owing to the practical difficulties of getting suitable food for the Platypus, and the probability of its dying if kept longer in captivity, the surviving specimen had been liberated in the Sydney Botanic Gardens, in the hope that the ponds will prove a suitable habitat. Mr. le Souef intends trying to get Platypus to breed in the large ponds in the Centennial Park, and all lovers of Nature will wish him success in his experiment.

Very great interest was taken in the new large aviaries, in which were living examples of the Bird of Paradise (*Paradisida Finch*), the Yellow-tufted, White-checked, Lunate and Spinebilled Honey-eaters; also Lamberts and the Superb Wrens, the Hooded, Scarlet-breasted and Yellow-breasted Shrike Robins; also pairs of White-fronted *Ephthianura* and White-eye-browed Wood Swallow, and a Bee-eater. The Bird of Paradise is fed on bananas and other fruit; the Honey-eaters on syrup made from brown sugar, it having been found that they do not thrive on bees' honey, while the Bee-eaters get chopped meat.

On the invitation of Mrs. le Souef, the visitors were entertained at afternoon tea, when Mr. Steel, on behalf of the party, thanked their hosts for the very instructive and enjoyable afternoon. This excursion was one of the most successful in every way which the Club has had.

T.S.

EXCURSION TO COMO.

BETWEEN 30 and 40 members attended the excursion to Como on 9th September. In the absence of Mr. G. A. Waterhouse, through sickness, the leadership was undertaken by Messrs. Gurney and Cheel. Wild flowers were particularly plentiful.

and amongst those obtained in blossom were:—*Pomaderris ericifolia*, *Ricino-carpus pinifolius*, *Dilwynia ericifolia*, *Correa speciosa*, *Brachyloma daphnoides*, *Olearia ramulosa*, *Hardenbergia monophylla*, *Pomax umbellata*, *Grevillea sericea*, and many others.

Insects were fairly plentiful and the following are the more notable of the catches:—Amongst butterflies, a few "whites" and "skippers." A small yellow moth, *Philobota* Sp., was particularly plentiful upon flowering shrubs. A rare cup-moth larva, *Xylomeli apoda*, was found on a Banksia leaf. This flat, green, legless grub, with its sluggish movements, shows admirable protective mimicry, being of a green tint like that of its food plant, and having a median dorsal yellow stripe harmonising with the yellow midrib of the Banksia leaf.

Several Tenebrionidae (*Amarygmus* and *Pterohelaenus*) were taken; also a few Buprestids (*Cisseis*), but *Stigmodera* was not observed. Several *Aulacocyclus edentulus* were found in a rotten log. One interesting specimen collected was the gall of a *Trypeta*, a fly allied to the destructive fruit flies. This fly causes the growth of galls on the Snowberry bushes, in which the maggot develops. The gall grows to about one-third inch in diameter, is circular, hollow, green in colour, and covered with tiny green leaflets. Dozens of these green ball-like galls were seen on each plant.

E.S.E.

W.B.G.

CLUB EXCURSION, SATURDAY, 5TH AUGUST, 1911.

THE first excursion of the Club's new year took place on Saturday, 5th August, and was eminently successful. We were favoured with perfect weather, the collecting done was very good, and the attendance numbered forty-three. The excursion was held at Maroubra, and was led by the President, Mr. Cheel. Mr. W. B. Gurney also helped the entomological collectors. Two lady visitors from California were amongst the party. Mr. John Shirley, B.Sc., a prominent educational expert from Brisbane, joined us for the first time, as also did Dr. Petrie, of the Sydney University. The bush flowers were plentiful, and a few beetles were secured. After collecting, the billies were boiled. Mr. Finckh photographed the party, and Mr. Cheel explained and named the various plants collected and answered any questions.

THE ALTERATION OF OLD-ESTABLISHED BIRD NAMES.

A PROTEST.

(By W. W. Froggatt.)

AMONGST recent writers on Australian Birds there has arisen a tendency to change the established popular names of birds. Certain birds have been widely known right down from the time of Gould, by particular names, for the most part given by that great observer himself. Gould had a specially happy knack of adopting native and popular names, and these have ever since been accepted and used by hosts of students and observers of our avifauna. Not only is the indiscriminate changing of these names most confusing to the young naturalist, but it is a source of annoyance and loss of time to the advanced student who may have occasion to use the works in which such changes of nomenclature have been adopted. It seems a pity that this procedure should have been followed in such works as the just published "Birds of Australia" by Lucas and le Souef, and the previous volume, "The Animals of Australia," by the same authors.

A few instances may be cited. Every one on our coast knows as the "Bell Bird" that dainty little olive green Honey-eater of our forests, with its quaint bell-like note. Kendall has immortalised it in his poem "Bell Birds." Gould calls it *Manorhina melanophrys*, Bell-bird. Wheelwright (Old Bushman), in his "Bush Wanderings of a Naturalist" (published in 1861), describes it in the Gippsland forests as the *Bell-bird*. Now some of the modern bird men have decided that the "Bell-bird" is not the "*Bell-bird*," but the "Bell-Minah"; they have transferred the name "Bell-bird" to a Shrike Thrush, *Oreoica cristata*, described by Lewin and long known popularly as the Crested Oreoica. This bird chiefly frequents the inland portion of Australia, and its claim to the popular name of our little bird is that some local settlers call it the "Bell-bird." Again, Hall, in his "Insectivorous Birds of Victoria," calls the same bird simply the "Bell-bird," not even the "Crested Bell-bird," which would have been a sufficiently distinctive title. Campbell follows the same example, and now we find it perpetuated in the new "Birds of Australia." North, on the other hand, very rightly retains the name "Bell-bird" for the little coastal honey-eater, and calls the western bird the "Crested Bell-bird."

Taking another example, *Struthidea cinerea*, which Campbell calls the "Grey Jumper" in one place, and in other speaks of it as the "Apostle Bird"; in "Birds of Australia," it is termed the "Grey Jumper," and neither in letterpress nor index does the reader find the name "Twelve Apostles," "Apostle Bird," or "Happy Family." By one or other of these appellations it is known to bushmen and settlers all over Australia, and it is so designated by North, while in the Birds Protection Act, New South Wales, it is listed as "12-Apostles" or "Happy Family," without any scientific name being given.

There is plenty of room for improvement in some of our bird names, such as the "Log Runners," which are in no way distinctive, but old-established and widely-used vernacular names which have the merit of being appropriate, might be left in peace by the modern birdman, with advantage alike to the student and the public at large.

ABSTRACT OF PAPER "ON THE NEED FOR MORE
UNIFORMITY IN THE VERNACULAR NAMES OF
AUSTRALIAN EDIBLE FISHES,"

By David G. Stead, of the Department of Fisheries,
New South Wales.

In this paper the author draws attention to the almost complete absence of any system in the application of common names to our edible fishes, a state of matters which is responsible for species of widely different relationships being grouped under one common terminal name, even in the waters of an individual State, and under the same name in several of the States or in New Zealand. On the other hand, one species of food-fish distributed throughout the waters of each State is frequently known and recognised officially under a different name in each place. A number of instances of each group are given to illustrate the matter, and from a study of these it is apparent that this diversity of nomenclature is a serious stumbling-block in the path of Australian fisheries knowledge, as it is clear that the people-at-large throughout these lands—when they read of the occurrence of any particular fish—picture to themselves the species known to them locally under that name. The Jewfish of New South Wales is the Kingfish of Victoria and the Butterfish of South Australia; the Kingfish of New South Wales being the Yellowtail of Victoria. The Yellowtail of New South Wales is, of course, to be numbered usually among the very small fry, while the Yellowtail of Victoria reaches often a length of 6 feet, with a weight up to 100 lbs. The

derision of the local angler or fisherman when he hears of Victorian Yellowtail that size is easily imagined. The local Sea Mullet is known in Victoria as Sand Mullet—a term applied here to an insignificant species. Many other instances are given.

Mr. Stead points out that now—when the peoples of Australia and New Zealand are devoting more attention to their fish-fauna and their fisheries—is the time to grapple with this question, and that the surest way of dealing with it is for the various Governments (that have not already done so) to co-operate with each other, and officially devote attention to the matter by appointing, permanently, competent men to study this and allied Fisheries questions.

The lists given will be useful for reference purposes.

“AQUATIC INSECTS.”

*Abstract of Presidential Address, 1st Aug., 1911, by
W. B. Gurney, F.E.S.*

WE are perhaps apt to conceive the terrestrial animals constitute the great bulk of the animal life of the globe. Yet, of the 12 large groups or phyla of the animal kingdom, six are wholly aquatic, and the other six largely consist of aquatic forms. Almost every type, therefore, from the simple single-celled Protozoans to the highest animals, from the Amoeba and Globigerina to the huge warm-blooded whale, is represented in the water fauna.

On land, the Phylum Arthropoda, which includes Insects, Spiders, Centipedes, etc., is most numerous in species and individuals. This predominance is in great part due to the success of the little animals known as insects. The Insecta, it is estimated, include about 250,000 distinct species so far described and named. As Dr. David Sharp has pointed out, “Insects far outnumber in species all other terrestrial animals together.” Let me indicate this with regard to the Australian fauna. According to Messrs. Lucas and de Souef’s recent work, “Birds of Australia” (1911), there are 863 species of Australian birds. In contrast, note, there are 10,000 species of beetles alone, described from Australia. Of other forms, there are 51 species of Amphibia, 202 Reptiles, and 181 Mammals, which, with the Birds, makes a total of 1303 Australian vertebrates. There are, however, at a rough estimate, over 20,000 Australian insects described.

The success of insect life is considered due in part to their small size, their numerous progeny, and their acquisition of wings. The predominance of insects stops at the water’s edge, for though aquatic insects are plentiful they are not nearly so numerous as on land. And this leads us to

consider the breathing of an insect, which is effected, not through the mouth, but by means of small apertures (spiracles) along the sides of the body, whence the air passes into a wonderful system of delicate branching tubes (trachea) which extend throughout the body and appendages. Thus the air is, as it were, conveyed to the blood, not, as in man, the blood conveyed to the air of the lungs. All adult aquatic insects breathe exactly as land insects do, but many are the curious devices for obtaining air or carrying a supply of it below the surface of the water. It is in their larval (grub) stages that water insects are more truly aquatic; some breathe air direct by coming to the surface, others have developed tracheal gills and absorb air from the water. It was advanced by Lord Avebury and others that probably primitive insects were all aquatic and breathed by gills, and that later they acquired the capacity of breathing by spiracles. There is, however, stronger evidence that the reverse is the case, viz., that primitive insects were terrestrial, breathing by spiracles, and that aquatic habits were comparatively recently acquired; acquired in most cases long after the wings were developed, and most of the great insect orders we are familiar with had become differentiated. This view is supported by the fact that the more primitive present-day insects, such as Silver Fishes and Cockroaches, are not aquatic. Also, there is not a distinct order of aquatic insects, but aquatic habits have been acquired by members of widely different orders. Again, some aquatic larvae with gills show functionless spiracles, indicating priority for the spiracles and direct air breathing habits in these cases.

Australia is rich in aquatic insects, and with two or three exceptions all types found elsewhere are recorded here. The knowledge of our own water insects, and more particularly of their habits, is very limited, and there is a large new field for even a novice in natural science who cares to carefully observe and accurately record the habits of Australian water insects. These insects can be conveniently observed by keeping them in glass jars of water with suitable aquatic plants growing in the water.

Reviewing our species, we shall see how almost every Order of Insects is represented in the water. I give below a list of the principal families of aquatic insects recorded from Australia:—

Order COLEOPTERA (Beetles).—Fam. Dytiscidae (Carnivorous Water Beetles), 154 species; Fam. Gyrinidae (Whirligig Beetles), 20 species; Fam. Hydrophilidae (Water Beetles), 21 species.

Order DIPTERA (Flies).—Fam. Culicidae (Mosquitoes), 36 species; Fam. Chironomidae (Midges), 100 species; Fam

Simuliidae (Buffalo Gnats); Fam. Tabanidae ("Gad Flies," "March Flies"); Fam. Syrphidae (Hover Flies with rat-tailed larvae).

Order NEUROPTERA.—Fam. Odonata (Dragon-flies), about 120 species; Fam. Tricoptera (Caddis Flies); Fam. Sialidae (Alder Flies); Fam. Perlidae (Stone Flies); Fam. Ephemeridae (May-flies).

Order HEMIPTERA (Bugs).—Fam. Hydrometridae (Fresh and Salt Water Striders); Fam. Belostomidae (Large Water Bugs); Fam. Notonectidae (Back Swimmers); Fam. Corixidae (Water Boatmen); Fam. Nepidae (Water Scorpions).

Order LEPIDOPTERA.—Fam. Hydrocampidae (Moths with water weed caterpillars which breathe by gills).

Order APTERA.—*Podura* spp. (minute leaping insects of surface of pools).

We have also small grasshoppers and crickets which frequent marshes and edges of pools, and some semi-aquatic beetles of the ocean beaches. In Europe a few species of parasitic Hymenoptera are known which swim through the water, some with their legs, others with their wings, and lay their eggs in Dragon-fly eggs, Caddis-fly larvae, etc.

Many of the oval-bodied carnivorous water beetles (Dytiscidae) are plentiful in Sydney ponds and creeks. Sometimes, even in temporary rain-pools, they may be found disporting and frequently diving, some carrying an air bubble at the tip of the abdomen. Diving is a particular habit, and Linnaeus, in recognition of this, called the first genus *Dytiscus*, which means fond of diving. The adults fly at night, and a single night may people a pool with these beetles. They are voracious feeders on other water insects, larvae, tadpoles, and even small fish, and are dangerous in an aquarium where other small forms are being observed. A common Sydney species is *Rhantus pulverosus*, less than half an inch long; it is dark, smooth, and glossy. Our large species is *Cybister tripunctatus*, which is a very deep green, almost black, and margined with a yellowish band. *Eretes australis* I have taken in bore water near Bourke, and it is probably one of the commonest species throughout western N.S.W. in ponds and bore tanks. It is a somewhat light brown species, about the size of *R. pulverosus*. These Dytiscidae may live as adults for a year or two, longer than usual with insects. They possess sharp biting jaws, and are direct cousins of the well-known land predaceous beetles (Carabidae) found commonly under logs. All the time they are under water they have an excellent supply of air tucked away under the wing covers where the breathing spiracles open. To renew the supply they need but swim, or float to the surface, for they are lighter than the water, expose the tip of the abdomen,

and refill the space beneath the wing covers with fresh air. The larvae are as voracious as the adults, and armed with large hollow jaws suck the juices of their prey. They breathe through spiracles at the tip of the abdomen, and not by means of gills as do the larvae of the Whirligig Beetles (Gyrinidae). These Whirligig Beetles all will remember by their wild, eccentric skating on the surface of pools.

Probably our largest water beetle is *Hydrophilus latipalpus*, over an inch long, and glossy black. It is so sluggish in the water that after seeing the swift darting Dytiscidae and the Whirligigs, it gives one the impression it is a land beetle which has fallen into the water. It uses its legs alternately, not in pairs, as the other water beetles do. I have seen a specimen swimming in the salt water of upper Middle Harbour, but it was probably there by accident.

In America and Europe a few Chrysomelid beetles of the genus *Donacia* lay their eggs on water weeds. The larvae drop to the bottom and feed on the weed stems, using a special spine with which they are provided, for puncturing the pith cells and obtaining a supply of air for the spiracles which are at the base of the spine. These are instances of air breathing, leaf-eating beetles acquiring aquatic habits in the larval stages.

Coming to the Dragon-flies (Odonata), we find them plentiful in Australia, and Mr. Tillyard has contributed valuable papers to the Proc. of the Linnean Soc. of N.S.W. on the habits of some of our species. Dragon-flies are often called Horse Stingers, though perfectly harmless and not possessed of a sting. Their wonderful flight and brilliant metallic tints are known to all, but in their young stages in water they present dirty brown or greenish colours, and crawl upon the mud and weeds. Both young and adults are predaceous. When skimming over the surface of the water as adults they are not merely enjoying the glorious sensation of flying, but engaged in a deadly attack on midges, mosquitoes, moths, etc., which may be in the air. The jaws are broad and embracive, and with mouth wide open they rush through the air seizing and devouring their small prey. The eggs of some are dropped indiscriminately into the water. Others—for instance, the common *Lestes leda*, the slender blue-banded Dragon-fly of Sydney—lay their eggs in water weeds. I recorded for the first time the egg-laying habits of the above species in this journal in 1907. The female, either alone or accompanied by the male clinging to her neck, descends the weed, sowing her tiny white cylindrical eggs into the weed by means of her needle-like ovipositor. The curious point is the female, perhaps with male, descends under the water, still laying her eggs in the weeds, and they may remain 10 minutes below water. Air is observable as a film

around the body and between the wings. Such a habit might perhaps be explained as an attempt to have the eggs immersed in water, even should the water evaporate and the surface sink several inches; or, is it to escape parasites or predaceous enemies of the air? It is of interest to note that several minute parasitic wasps, however, descend into the water and lay their eggs within dragon-fly eggs in the weeds. Such aquatic parasitic species have not been recorded from Australia, but investigation may yet show their presence. We cannot enlarge here upon the interesting habits of Dragon-fly larvae, or nymphs as they are called. They possess a hinged under lip capable of sudden extension to grasp living prey. They breathe by gill plates at the tip of the abdomen as in *Lestes*, or the gill plates are absent and water is taken into the rectum, and there the blood is aerated in special folds of the rectum. And this water may be ejected from the rectum with such force as to drive the larvae forward with a darting movement. Altogether these nymphs form most interesting aquarium specimens. They live perhaps two seasons in many cases, and are to be obtained plentifully in the mud and weeds of our pools, even in midwinter.

Our largest Sydney Dragon-fly is *Petalura gigantea*, about $4\frac{1}{2}$ inches across the wings, but the largest Australian species, and perhaps in the world, is *Petalura ingentissima*, a species recorded from Queensland by Mr. Tillyard, and which is over 6 inches across the outspread wings. The genus *Petalura* presents an addition to the unique types of the Australian fauna, and the abdominal appendages of the male and other features, as Mr. Tillyard has pointed out, indicate that they are primitive forms structurally.

Of other groups it may be mentioned we have, as indicated in the list, Stone-flies, May-flies, Caddis-flies, etc., which all have aquatic larvae, but scarcely any of our forms are known to science. These larvae are favourite food of the freshwater fish, and anglers the world over use them for bait, and, incidentally, hosts of local names for these aquatic larvae have arisen. Of two-winged flies with aquatic larvae there are small, slender crimson larvae known as blood worms, commonly found in the mud scooped from the bottom of our pools. These are the larvae of *Chironomus* (Midges). They form a favourite food for freshwater fish. Examination in lakes and ponds in New York State and Yellowstone Park, U.S.A., showed that 50 per cent. of the diet of certain brook trout consisted of these blood worms. Allied to *Chironomus* is the genus *Ceratopogon*, to which our Sydney Sand-flies, *Ceratopogon molestus*, Skuse, belong. Some species of the genus have aquatic larvae, but the larvae of many live in damp places, wet soil or bark, liquid gum of trees, etc.

We have a number of Water Bugs, the largest of which (*Belostoma indicum*) was commonly caught during May and June last about electric lights in Sydney and the suburbs. It is a large brown, oval-shaped creature, with large eyes, and short, stout, sucking beak, and at night may leave the water and fly to other pools. It is predaceous, and attacks other water insects, and even small fish. Our common Sydney "Water Boatman" is *Corixa geoffreyi*, and our "Back Swimmer" is *Enithares bergrothi*, though allied species are also to be found. There is a slaty or brown flat bug, about an inch long and resembling a piece of dead leaf, which crawls with sluggish movements in the mud and leaves of the pools. This is well named the "Water Scorpion" (*Nepa tristis*), as its appearance suggests some venomous form. It preys on other insects, which it captures in the large nipper-shaped front pair of legs. Behind is a long, slender siphon, as long as the body, which is projected above water to take in air. The wings are well developed, and when expanded the dull brown body is relieved by the brilliant brick-red colour of the upper surface of the abdomen in contrast.

Eristalis tenax is the common Bee-fly of Sydney gardens, a fly that so resembles a bee in colour, shape and hum, as to deceive all who do not examine it closely. This common fly is a cosmopolitan species, and, after its mimicry, interest centres in the curious larvae, which are known as "rat-tailed larvae." They live in water containing decaying vegetable matter. I have taken such larvae in a pool 3 inches deep in a hollow on a fallen tree where a few dead leaves had accumulated, and their extremely long, slender tails were projected at the surface to take in air. These tails are telescopic, and can be projected according to the depth of the liquid some 3 or 4 inches, which is several times the length of the body.

In conclusion, the Mosquitoes, which occur to one whenever aquatic insects are referred to, cannot be more than mentioned here. Their tiny wriggling larvae are familiar to all who have looked into pools by the roadside, in the bush, or, about the house, in flower pots, tins, or roof guttering where water may collect. The fact of their role in carrying disease has focussed much attention on the group, and Australia has her share of species. The *Anopheles* and certain other genera are capable of conveying malaria germs from man to man, and we have members of the first genus in Australia. The *Stegomyia fasciata*, the "yellow fever" intermediate host, is also found in Queensland and Port Darwin, though fortunately the disease is not here. One of the common house and bush mosquitoes of N.S.W. and Queensland is *Culex fatigans*, which has been shown to carry filariasis, and probably also Dengue fever.

REVIEWS.

THE BIRDS OF AUSTRALIA.

A. H. S. Lucas and W. H. Dudley le Souef. Melbourne, 1911: Whitcombe and Tombs.

THIS is published as a complementary volume to the "Animals of Australia" by the same writers and publishers.

The book consists of 489 pages of letterpress, interspersed with over two hundred text blocks and full page illustrations, and six coloured plates of groups of birds.

If we take this book as an illustrated catalogue of our bird fauna, it is a valuable addition to the various bird books that have been published during the last few years. The bird lover and student, however, would have probably hoped to see more original matter, and new facts regarding their habits and life history.

It can be well understood that the joint authors had to condense their matter in a book of under five hundred pages, but it is a pity that the matter is not more even. For example, the *Gannet* has five pages, including the text blocks, and six are devoted to the Lyre Bird, while the Black Swan, the Pied Goose, and the Black-breasted Plover have just five lines each of descriptive matter. That quaint bird, the Musk Duck, is given eight lines; no mention is made of her interesting habits, or how she dives through the water with her ducklings on her back when in danger. And the authors say "it rarely flies." Did the authors ever see or hear of a Musk Duck, with its tiny wings, flying?

W.W.F.

A HANDBOOK OF DESTRUCTIVE INSECTS OF VICTORIA.

Part V. 1911. Chas. French, F.E.S.

THE veteran Government Entomologist of Victoria, who has just retired from active service on a well-earned pension, before leaving office has seen through the press the 5th series of his well-known "Destructive Insects."

Twenty-seven coloured plates of insects are given, with descriptive letterpress, and twelve plates of birds. The work

is on similar lines to the preceding four parts, and contains a lot of interesting matter; but one could wish that the lithography had been better.

There are also some insects included that can hardly be called injurious insects of Victoria, such as the Sweet Potato Weevil (*Cylas formicarius*), or the Salt Bush Scale (*Pulvinaria maskelli*).

Some of Mr. French's popular names will hardly come into general use, one may hope. "*Feathery-horned Yellow Box Borer*" for *Distichocera macleayi*, as an example. While "*Gum-tree Moth*" for *Roeselia lugens* hardly conveys much meaning to the naturalist.

W.W.F.

NOTES AND COMMENTS.

BIRDS ATTACKING BUTTERFLIES.—Now that the butterfly season is with us once again, members are requested to closely note any instances that may come under their observation of birds attacking butterflies, and to secure, whenever possible, the names of the aggressor and victim, and the extent and nature of the injury sustained by the latter. Records, with localities and dates, should be addressed to the Hon. Editor, so that they may be published in the journal. In this respect both ornithologist and entomologist may assist.

OSPREYS.—It is with regret that we noticed in the advertisement of a leading Sydney establishment that ospreys were to be fashionable for millinery this season. How long will this abomination be tolerated?

EARLY RECORD FOR A DRAGONFLY.

ON July 28th, a fine specimen of the large brown dragonfly, *Hemianax papuensis*, was brought to me, having been knocked down and killed by one of the boys on the playground at Sydney Grammar School. It was a female, in splendid colour, and appeared to have been only two or three days emerged. This date is nearly a month earlier than any other record for this insect. Only two other dragonflies, *Lestes leda* and *Diplacodes bipunctata*, have ever been seen on the wing around Sydney in July.

R. J. TILLYARD.

N.S.W. NATURALISTS' CLUB.

Statement of Receipts and Disbursements for the year ending
July 31st, 1911.

RECEIPTS.

To Balance from last year, Savings Bank..	61	17	11	
Hon. Treasurer	3	1	5	
				64 19 4
Subscriptions, Current Year	34	17	6	
" Paid in Advance	4	15	0	
" Paid in Arrears.. . . .	2	5	0	
" Armidale Branch	1	5	0	
				43 2 6
Sales of Publications	0	4	6	
Advertisements in Journal	3	10	0	
Interest, Savings Bank.. . . .	3	5	0	
				6 19 6
				<u>£115 1 4</u>

DISBURSEMENTS.

By Rent of Hall	7	10	0	
Printing Journal	27	5	0	
Subs.—Science Congress	1	0	0	
Bookshelves and Sundries	2	19	0	
Typing Notices, &c., and Postage.. . .	9	11	10	
Printing Cards Annual Meeting, 2 years	1	19	6	
Postages and Stationery	3	2	6	
				14 13 10
Balance in Savings Bank	60	2	11	
" Cash in Hand	1	10	7	
				61 13 6
				<u>£115 1 4</u>

Examined and found Correct.

A. S. LE SOUEF, } Hon. Auditors.
C. H. WICKHAM, }

H. E. FINCKH, Hon. Treasurer.

July 31st, 1911.

THE
Australian Naturalist.

VOL. II.

FEBRUARY 6, 1912

PART 9.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

3RD OCTOBER, 1911. Ordinary monthly meeting, Royal Society's House, the President, Mr. E. Cheel, in the chair. The following were unanimously elected members:—Misses M. Deasy, Pattinson, Clark, Brown, Reilly, K. Phillips, B.A.; Messrs. H. S. Milne and James Kellick. It had been arranged that Mr. G. A. Waterhouse, B.Sc., would deliver a lecture, but owing to the regretted illness of that gentleman he was unable to do so and Mr. W. W. Froggatt gave instead a very interesting illustrated lecture on "Insectivorous Birds." The lecture was greatly appreciated, and Mr. Froggatt was heartily thanked for filling Mr. Waterhouse's place at short notice.

7TH NOVEMBER, 1911. Ordinary monthly meeting, the President, Mr. E. Cheel, presiding. Messrs. L. Hindmarsh and Nichol were nominated for membership. Mr. W. S. Dunn, Government Palaeontologist, delivered a lecture on "The Geography and Botany of Gondwana Land." The lecture, which was copiously illustrated with lantern slides, was listened to with close attention by the large audience. The lecturer reviewed in a very lucid and convincing manner the evidences on which Australia, South Asia, Africa, and South America are grouped together under the collective title of Gondwana Land. The exhibits were as follows:—Miss Mabel Brewster: Mud cells of a species of wasp, also life stages, larva, pupa and adult of the spotted lady-bird *Leis Conformis*. Mr. Wickham: A fine series of grass-green larvae and pupae of the Brown and Yellow Butterfly, *Tisiphone abeone*, with the adult insect, all of which were collected at Brookvale, near Manly, in October, the larvae being taken on their food-plant, the common sword grass.

Mr. Wickham also brought duplicate beetles for exchange, these being distributed amongst those interested. Master Oliver Edwards: Living beetles, *Phyllotocus*, Mr. Gallard a fine collection of miscellaneous insects from various parts of New South Wales, and from New Guinea. Mr. A. D. le Souef: Living examples of snakes and lizards. Mr. E. Cheel exhibited specimens of six species of grasses, collected

during the excursion to the Centennial Park, the names of which are given in the report..

5TH DEC., 1911. Mr. E. Cheel (President) in the chair. There were present about 54 members. Mr. Nichols, Miss Clarice Pickering, and Mr. Beckford were elected members. Mr. W. Mervyn Carne delivered a lecture on "Botany through the Camera." Mr. Carne lectured under extreme difficulties, being very unwell, and was only able to deliver a part of his lecture. This, however, proved so interesting that the meeting unanimously requested him to repeat the lecture at a future date. A paper by Mr. Cheel, entitled "Notes on the Effects of Artificial Light on Deciduous Trees" followed. This very interesting paper is printed in full in the present issue.

EXCURSION TO CENTENNIAL PARK.

On Saturday afternoon, 7th October, the members went to the Centennial Park, chiefly to collect grasses, which are very plentiful there, and also to inspect the Native Flora Plantation, on the invitation of the overseer (Mr. J. Dawes). There was a large number of members present, who were led by the President, Mr. E. Cheel, through the flats where the native flora has been left undisturbed. The season was rather too early for grasses, but still a few species were collected including *Poa annua*, *P. pratensis* (Kentucky Blue Grass), *Bromus unioloides* (Prairie Grass), *Holcus lanatus* (Yorkshire Fog or Soft Grass), *Briza minor* (Small Shivery or Quaking Grass), *Anthoxanthum odoratum* (Scented Vernal Grass), as well as *Cynodon dactylon* (Couch Grass), and *Stenotaphrum Americanum* (Buffalo Grass), which make up the turf or lawns throughout the park.

In addition to the grasses, the members were delighted to find a good number of species of typical coastal plants, including *Vimmaria denudata*, *Sphaerolobium vimineum*, *Bossiaea ensata*, *Dillwynia floribunda*, *Drosera binata*, *Amperea spartioides*, *Stypandra glauca*, *Triglochin procera* and *Heleocharis sphacelata*, the last-mentioned being a great pest in the dams.

After having spent nearly an hour in watching the members of the Aquarium Society (who also visited the park in search of aquatic life) as well as collecting specimens of the native flora found in a wild state, the members were then shown through the Native Flora Plantation by Mr. J. Nichol, who is in charge of this section. Mr. Nichol explained the

methods of the cultivation of the native flora, and the members inspected the various species, of which there were upwards of 80 in flower. A list of those most noteworthy is appended hereto.

After having spent a very pleasant time in inspecting the plants, which were from all parts of Australia, the members were shown through the propagating grounds by Mr. Hardy, who explained the different methods of propagation of plants, and answered the numerous questions plied by the members, who were immensely interested in this particular branch of work in connection with the vegetable kingdom.

Mr. Dawes (overseer) then took charge of the members and conducted them to his house at the Queen-street entrance, where Mrs. Dawes entertained them most hospitably at afternoon tea. The kindness of Mr. and Mrs. Dawes was greatly appreciated, and a vote of thanks, moved by the Secretary (Mr. Edwards), was carried and conveyed with the utmost cordiality. A few Australian plants cultivated in the Centennial Park:—

Thomasia triphylla J. Gay (Sterculiaceae). A very showy West Australian plant, having rather large, purplish calyx-lobes and no petals.

Eriostemon myoporoides D.C. (Rutaceae). A N.S.W. shrub producing very pretty white or pink flowers in abundance.

Phebalium Billardieri A. Juss (Rutaceae). A fairly large shrub with foliage silvery white underneath.

Swainsona Cadellii F. v. M. (Leguminosae). A very pretty pea-flowering plant, closely allied to the Darling-pea.

Extasia empetrifolia (Schlecht (Leguminosae). A small shrub with orange or yellowish flowers and somewhat spiny branchlets.

Acacia cyanophylla Lindl. (Leguminosae). *Acacia rostellifera* Benth. (Leguminosae). Two West Australian wattles, the first mentioned being a very showy tree when in full flower.

Melaleuca hypericifolia Sm. (Myrtaceae). An ornamental shrub both as regards foliage as well as flowers of a crimson color.

M. ellipticum Labill. (Myrtaceae). A West Australian shrub producing large, showy, red spikes of flowers.

Kunzea opposita F. v. M. (Myrtaceae). A small shrub with terminal heads of pinkish-coloured flowers and hoary branches.

Leptospermum scorparium (Myrtaceae) var *rotundifolium* Maiden and Betche. A very pretty flowering N.S.W. shrubby-plant.

Calothamnus chrysantherus F. v. M. (Myrtaceae). A West Australian plant, with orange-reddish coloured flowers.

Anthocercis viscosa R. Br. (Scrophularineae). A straggling shrub producing large whitish flowers.

Isopogon Dawsoni R. T. Baker. (Proteaceae). A New South Wales plant, with yellowish flowers.

Grevillea laurifolia Sieb. (Proteaceae). A trailing plant common on the Blue Mountains, but rarely seen under cultivation.

G. alpina Lindl. (Proteaceae). A diffuse shrub with rather dingy coloured flowers.

G. Endlicheriana Meissn. (Proteaceae). A West Australian shrub with slender branches and creamy-white flowers.

G. montana R. Br. (Proteaceae). A New South Wales species found chiefly on the Blue Mountains and Southern Tablelands, bearing greenish flowers faintly tinged with brown.
E.C.

EXCURSION TO OATLEY.

About 30 members attended this excursion. While there is nothing special to note, the afternoon was spent in a most profitable and enjoyable manner, good collections of insects being secured.
W.B.G.

EXCURSION TO HAWKESBURY COLLEGE.

This was an all-day excursion on Saturday, 8th Dec. About 25 members met at the 8.55 a.m. train, reaching Richmond at 10.45, from which place they were conveyed by coaches to the college. Here the visitors were met by Mr. W. Mervyn Carne, who showed the party over the college, and grounds, and explained how the work is carried on. The experience was most novel, and a great surprise to most of those present, and Mr. Carne's kindness and courtesy were much appreciated. The thanks of the Club are also due to Mr. H. C. L. Anderson, M.A., Under-Secretary for Agriculture, through whose kindness the visit was arranged.

E. S. E.

NOTES ON THE EFFECT OF ARTIFICIAL LIGHT ON DECIDUOUS TREES.

(By E. Cheel.)

During the latter end of June, 1910, I was rather surprised to see one of the Plane-trees in Pitt-street, close to the Central Railway Station, with a number of its branches bearing many fresh green leaves, whilst the other branches were quite denuded.

Knowing that the Plane-tree belonged to the deciduous or leaf-shedding class of plants, and that most of this particular species had shed their leaves nearly a month previously, I was rather anxious to know the cause of this particular tree having some of its branches retaining their leaves so long, so decided to investigate the matter by closely inspecting the other trees in the same neighbourhood.

In continuing my inspection of those trees along Eddy-Avenue, I noticed four others with some of their branches still retaining leaves; these, like the one in Pitt-street, were all fairly close to the electric lights, so that it seemed to me that these artificial lights must have some influence on the trees and thus caused them to retain their leaves for a longer period than those situated farthest away from the lights.

A large number of trees are planted along Elizabeth and Pitt streets, but as all of these (with the exception of the one near the Pitt-street Railway Entrance) were not near any light, the branches in every case were quite denuded of their leaves.

On May 16th, 1911, I examined the trees all around the station, and found most of them had shed their leaves, but here and there a tree had some branches with a few leaves still hanging on. Those trees near the electric lights, had most of the branches on the side of the trees nearest the lights, fairly thickly clothed with quite green leaves. During the first week in June, several sharp frosts occurred, and as a result, all the trees away from the lights lost their leaves.

On June 28th, and July 15th, I again examined the trees near the lights, and found in every case a few leaves still hanging on. Those nearest the lights having more leaves, and of a fresher green than the others. On August 2nd, I made a further inspection and found that the four trees in Eddy-avenue, had at last shed all their leaves, but the tree at the Railway Entrance in Pitt-street, still retained a few, those on the tips of the branches nearest the light being quite fresh and green, so that there can be no doubt that the arti-

ficial light at night has had a stimulating effect on these particular branches, and induced the sap to flow for a longer period than under normal conditions.

Having satisfied myself that through the influence of light, the leaves on these particular branches had been induced to remain on the branches, I thought it well to watch these particular branches in the spring, to note the development of the buds.

On September 7th, all the trees began to burst open their buds, and on the 17th of the same month, the leaves were fairly well developed. Those branches on the trees near the lights which had retained their leaves during the most of the winter, had the buds still unexpanded, on the above-mentioned dates; and these did not commence to expand until September 27th, and even then only those on the lowest part of the particular branches were commencing to burst, whilst those on the tips nearest to the light were quite dormant.

Further inspections were made on October 15th, and November 3rd, and still some of the buds were unexpanded, while as late as December 7th the last of the buds were just opening.

RECENT LITERATURE.

(*Australian Araneidae.*)

A census of Australian Araneidae has long been required and this want has now been filled by the publication of one on a very complete scale by our fellow-member, Mr. W. J. Rainbow, F.L.S., issued as a part of the "Records of the Australian Museum." It will perhaps be a surprise to many to learn that some 1,200 species of spiders have been already described from Australia, while a large number of undescribed species are in the hands of various collectors and specialists.

The present census will be of great value to future workers, bringing together as it does the scattered references to this important group, some of which are by no means easy of access in Australia. The value of the work is greatly enhanced by a copious bibliography and synonymy, and a very full index of family and generic names.

AUSTRALIAN HYDROZOA.—From the Australian Museum there has also been issued Part 16 of the Scientific Results of the "Thetis" trawling expedition. The present part is by J. Ritchie, M.A., B.Sc., of Edinburgh, and deals with the Hydrozoa.

NOTES AND COMMENTS.

PLATYPUS.—We were exceedingly pleased to notice the following report in the Sydney "*Daily Telegraph*," for September 23rd:—

"YASS, Friday.

"At the Barron Jack Police Court, James Fallon was proceeded against by Senior-constable Gibson for having four duck-billed platypus skins in his possession. Fallon pleaded guilty, and was fined £1 per skin, and costs. Mr. F. A. Ridley, P.M., commenting on the case, said the platypus was rapidly becoming extinct, and had rightly been protected by the Government."

It would be well if more of those responsible for the administration of the laws applying to the protection of the native fauna, had as keen a sense of duty as Senior-constable Gibson. The action of this officer will meet with the warm approval of all lovers of nature.

MOSQUITOES.—The following paragraph from an American paper, shows how readily entirely erroneous statements may become current. It formed the subject of a letter of inquiry to Mr. Froggatt:—

"The *Drosera binata*, an Australian plant, is claimed to be an unrivalled destroyer of mosquitoes. The glands on its branches contain a fluid limpid at night mucilaginous and sticky and as sweet as honey. The flavour attracts the mosquito, the mucilage holds it, and the poisonous property of the liquid kills it. This plant has been imported into the United States.—*The Barbados Standard*."

BIRD ATTACKING BUTTERFLIES.—In August, 1911, I observed a "Jacky Winter" chasing two of the blue and black butterfly (*Papilio Sarpedon*) about a camphor laurel tree. The bird was several times within 4 or 5 inches of the butterflies, which flew close together, and were seemingly much excited. They only escaped the bird by their erratic flight. Dodging and doubling, they at last suddenly dashed over the top of the tree and were followed by the bird, but I saw no more of them.

WM. B. GURNEY.

I have much pleasure in reporting that I observed a "Water Wagtail" capture and devour a *Heteronympha Merope* and also a *Junonia Vallidia* butterfly. The bird stood on the body and tore off the wings, which were discarded, the body only being eaten. E. H. WICKHAM.

BIRD DAY. It was with much pleasure that we read in the newspapers of the manner in which Bird Day was held and the encouragement to this important movement, which

was given under the enlightened administration of the Department of Education.

The N.S.W. Gould League also held its annual meeting in December last, when an extremely satisfactory report was presented.

Enormous benefit will surely follow the recognition of the value of birds, so well fostered by these institutions.

INTERNATIONAL CONGRESS OF ENTOMOLOGY, 1912.

Last year, 1911, the First International Congress of Entomologists was held in Brussels, in the first week of August, when a large and representative gathering of entomologists met and discussed the great questions of economic and scientific entomology.

Twenty-three States are represented, and leading entomologists act as local agents in different parts of the world from whom all information can be obtained. Mr. W. W. Froggatt, Government Entomologist, New South Wales, is representative for Australasia. Next year (1912) the Second Congress is to meet on August 17th, at Oxford University, where rooms for men will be available at a moderate cost, but the Executive Committee invites an early provisional notice of intention to join the Congress, in order that arrangements may be made for the necessary accommodation. The proceedings of the first Congress are in the press, and will be published shortly.

Dr. Malcolm Burr, c/o of the Entomological Society of London, is the General Secretary of the Executive Committee. Any member of an Australian scientific society who contemplates visiting England this coming year, could, by sending a subscription of £1, become a member, and could have a very interesting visit to the famous city of Oxford, where he would meet fellow-workers from all parts of the world.

The following letter from "Nature," October 12th, 1911, will be read with interest :—

THE DISTASTEFULNESS OF *ANOSIA PLEXIPPUS*.

In "Essays on Evolution," p. 274, 1908, Prof. Poulton directed attention to the instance of mimicry amongst Lepidoptera supplied by the American Danaine, *Anosia plexippus*, otherwise known as *Danaida arshippus*, and its mimetic species. It occurred to me, therefore, that it would be interesting to test the distastefulness of this butterfly. This I was enabled to do through the kindness of Mr. F. W. Frowhawk, who at my request sent me a newly emerged female on September 22nd of this year.

The following are the results of my experiments. Two Indian shamas (*Uittocincla macrura*) in succession tasted it, but left it alone after one or two pecks. It was then taken by an Indian siba (*Sibia capistrata*), which quickly dropped it. A red-vented bulbul (*Pycnonotus haemorrhous*) then pounced upon it, with the same result. A ground thrush (*Geocichla cyanonotus*) tried it, but soon left it. A mynah (*Gracula intermedia*) took it, but quickly let it fall. Two South African bustards (*Otis ludwigi*) persevered for a long time, but finally rejected it. A kagu (*Rhinochaetus jubatus*), a kind of rail or crane from New Caledonia, behaved in the same way, shaking his head after each peck. An Australian waterhen (*Tribonyx ventralis*) and a crow-shrike (*Barita destructor*) pecked it only once, the latter vigorously shaking his head and wiping his beak after the taste. A Cuban mockingbird (*Mimus orpheus*) and a Brazilian hangnest (*Ostinops viridis*) attempted it, but after a few pecks gave it up. Finally, the mangled remains were eaten with much hesitation by a rufous tinamou (*Rhynchotus rufescens*). Whether the latter would have eaten it, if given the first refusal, it is, of course, impossible to say; but there is no doubt that the other birds found the butterfly highly distasteful. I was particularly impressed by its rejection by the two bustards, which on previous occasions have eaten some of the most unpalatable of British insects (see Proc. Zool. Soc., 1911, pp. 809-68).

The birds used for these experiments belong to tropical American, Asiatic, Australian, and African species, and were purposely selected from a variety of families. *Anosia plexippus* has, I understand, comparatively recently invaded the Old World from the New; and the result of the above-recorded experiments suggests that no serious barrier to its dispersal will be offered by insectivorous birds. If it succeeds in widely distributing itself it may, as a useful model, bring about marked mimetic changes in the Lepidoptera of the districts in which it settles.

The Zoological Society.

R. I. POCOCK.

BIRD DAY.

We strongly commend to our readers the following extracts from "Bird-life Supplement" issued by the enlightened policy of the Education Department with the "Public Instruction Gazette," 30th September, 1911:—

HOW TO STUDY THE BIRDS.

A. G. HAMILTON.

School bird study should begin with the birds of the playground, and gradually extend to wider fields. The

children should observe the birds during their play-hours, and on their way to and from school. It is not a subject that can be fully dealt within formal lessons. Probably the best method will be to have observation talks, and an occasional excursion.

The children should record the birds seen and their observations on them in their note-books, and in a wall chart, such as that published in the "Gazette" for June, 1911. The chart is especially useful in creating interest among the pupils. Some years ago I had one in the Willoughby Public School, and the children were all eager to help to make it complete.

The local name and, if possible, the scientific name of the birds should be recorded. Some difficulty may be experienced in regard to local names. In different districts, sometime in the same district, a bird may be known by quite a number of names. A notable example of this is the babbler or chatterer (*Pomatostomus temporalis*), which our Secretary (Mr. Finigan) tells me is known by thirty names in the Wellington district. I know twelve names current for the same bird about Mudgee. Where no local name is known, something might be invented, if possible, indicating some peculiarity of the bird. Sometimes a translation of the scientific name might be suitable, but not in all cases. I do not see why well-known names such as peewit, blue wren, and jacky winter should be altered to magpie lark, superb warbler and brown fly-catcher.

With regard to collections of eggs for the school museum, I am entirely opposed to them. Everything that can be discovered about the relation of eggs to nesting habits can be better done by the observation of the eggs in the nest. No addition to the knowledge of birds can be made by having fifty or a hundred egg-shells in glass-topped boxes. Certainly they are beautiful things, but to lessen birds in a neighbourhood for the sake of showing pretty egg-shells is, in my opinion, entirely unjustifiable. And if there is a collection of eggs in the school, it is pretty certain that the boys will have private collections also. Every egg is a potential bird, and every collection lessens the number of birds in the neighbourhood. Our pledge specifies discouragement of the unnecessary collection of eggs. I think collections, except for an institution like the Australian Museum, are absolutely unnecessary. For the same reason collections of bird skins are also undesirable. I once was a skin and egg collector, but now I prefer to watch the birds with a field-glass, and to gain their confidence by kind treatment, if possible.

In England and America bird-lovers encourage birds by putting up nesting boxes, drinking vessels, and supplying food. Our Australian birds do not seem to take to nesting boxes. Certainly they will be occupied, but it will be by the sparrow and starling. But swallows often build on school verandahs, or even in the school-room itself. Many teachers object to this, as it dirties the floor beneath; but I think, when a bird places so much confidence in us as to build in such a situation, that we might put up with the slight inconvenience. A sheet of paper put beneath the nest and removed daily will keep the floor clean. Drinking troughs on a post are usually a great success. Even in the city many birds will visit these. A broad shallow dish of tin or earthenware is best—a large seed or flower-pot pan is excellent—as the birds not only drink, but bathe, giving an opportunity for the observation of their different modes of bathing. Many birds visit the playground for food after lunch time. But if a post is put up and a flat board nailed on top of it, crumbs, little scraps of meat, and a bit of suet may be put there. The suet should be tied or tacked to the board so that it may not be dragged off.

A BIRD SANCTUARY.

(An extract from an article by A. J. North, C.M.B.O.U.)

“For years past, at Roseville, I have encouraged the birds to breed around my house, and when unmolested, it is astonishing how soon they learn that the garden is their sanctuary. Honeyeaters of several species come regularly to drink or bathe in the summer time, to a large earthenware bowl of water placed there for their use. Young magpie larks, scarcely trouble to move out of one’s way. Yellow-breasted robins breed in the trees just outside the fence, and one season, in low bushes, the coach-whip bird. The grey shrike thrush is very tame, and utters its melodious notes on the verandah and ventures into the house; and, last year, a pair of black and white fantails (or more popularly known “willy wagtail”) forsook their usual nesting-place in a tree in an adjoining paddock, and built their nest and reared their young on the beam of a wooden screen sheltering one of our windows. While in the field, too, I have caught young birds, taken them to the Museum on the following day, photographed them, described them, and walked many a mile afterwards to return them to their parents.”

REVIEW.

AN AUSTRALIAN BIRD BOOK:—This is the title of a most excellent work on Australian bird-life, from the able pen of Mr. J. A. Leach, M.Sc., who is the Organising Inspector of Nature Study in the Education Department of Victoria. This is the book that we have all been waiting for. We have, perhaps, been more fortunate in the literature of our birds than we have in most of the other divisions of our Australian fauna, and a number of highly valuable works have at various times been produced, yet without detracting in any way from the value of these it may be said that nothing that has yet come before the public so eminently meets our general needs, as does this "Australian Bird-Book." In the small space of 190 pages is contained in the form of a continuous lecture, a great mass of closely-printed general information dealing with all the groups, and many of the individual species of our birds. (One might suggest that it is too closely printed, were it not for the fact that it has been the aim of those who produced it to keep the whole work in as small a compass as possible.) In addition there is a properly classified list of 395 species of birds in which helpful references and general particulars likely to be of aid in making determinations, are given. There are several hundreds of illustrations, of which no less than 168 are coloured, and these, though small, are really admirable. It is not too extravagant to say that this little work will be epoch-making, and will go far towards making that true patriotism which is so desirable—a patriotism which finds its origin in a love of the wild things of our land, rather than that which is founded upon an empty map, which conveys nothing. There is a nicely written introduction by Mr. Frank Tate, the Director of Education in Victoria.

It is pleasing to note that Mr. Leach's book has been taken up by the Departments of Education in Victoria, South Australia and Queensland.

The book is as much a credit to the publishers as it is to the author, and its low price (3/6) places it within reach of everyone.

DAVID G. STEAD.

THE
Australian Naturalist.

VOL. II.

APRIL 2, 1912

PART 10.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

6TH FEBRUARY, 1912. Ordinary monthly meeting, Royal Society's House, the President, Mr. E. Cheel, in the chair. Dr. Lovell and Mr. Sherriss were nominated for membership. Mr. G. A. Waterhouse, B.Sc., B.E., read a paper entitled "A Second Account of the Winter Butterflies of North Queensland," which was followed by a most interesting and instructive discussion. Master T. P. Steel exhibited five living specimens from Leura, of a rare burrowing frog *Philocryptus flavo-guttatus*, Fletcher, a note on which will be found under Notes and Comments. Miss Gladys Froggatt read an interesting note on *Culex vigilax*, Skuse, the salt water mosquito. Miss Froggatt's note, which supplies some important information, is printed in this issue. Mr. W. B. Gurney exhibited *Podocanthus Wilkinsoni*, a stick insect; *Scalidae*, aquatic insects; *Hepialidae*, wood moths; and two insectivorous bats, all from Jenolan Caves. Mr. Horan showed a moth cocoon, *Chelepteryx Colesii*; Master Oliver Edwards complete life stages of butterfly *Ialmenus evagoras*; Mr. Cheel, a collection of Australian mistletoes; Mr. Norman Witham, a collection of beetles from Kincumber; and Mr. H. E. Finckh, a live chameleon, the latter exhibit was most interesting, the projecting movable eyes being exceedingly well seen.

5TH MARCH, 1912. Mr. E. Cheel was in the chair and there was a crowded audience. Dr. Lovell and Mr. Sherriss were unanimously elected members. Misses N. Hudson, J. M. O'Dea, M. J. Wells, M. Dalby, and Mr. E. Breakwell were nominated for membership. Mr. W. Mervyn Carne delivered his lecture, "Botany through the Camera." The lecture was illustrated by a large series of beautiful coloured slides. The lecture proved extremely interesting, Mr. Carne bringing out some quite novel ideas in Nature study, and was followed by an animated discussion. The exhibits were a collection of varied insects from Blackheath by Mr. Hamblin, wasp's nest, *Polistes Tasmaniensis*, by Mr. Gurney, and Larvae of *Papilio egeus* by Master Oliver Edwards.

The Secretary announced that the next excursion would

be on 9th instant to Mr. Finckh's aquarium, by kind invitation.

White succulent fruits of a native "elderberry" (*Sambucus Gaudichaudiana*, D.C.), were also exhibited by Mr. Cheel, which were plentiful along the river embankment close to Weston's Caves, about $2\frac{1}{2}$ miles from Burrinjuck.

A SECOND ACCOUNT OF THE WINTER BUTTERFLIES OF NORTH QUEENSLAND.

By G. A. Waterhouse, B.Sc., B.E.

In 1910, I had the honor of presenting our Club with a few notes on my trip to N. Queensland in July of that year. The results obtained in 1910 were so important that I decided to again visit the same district in June of 1911. Although I spent less time in the Cairns district than in my previous trip, I was enabled to bring back more specimens and many more records.

Again choosing the comfortable S.S. Bombala, accompanied by my wife, we left Sydney on the 3rd June, 1911, reaching Kuranda on the 10th June after a most pleasant trip, enjoying to the fullest that portion, where the ship passed amongst the numerous islands within the Great Barrier Reef.

The weather at Kuranda was quite warm during the day, but the nights were cold. Here we stayed a week, collecting in the neighbourhood and making two excursions to the flat coastal strip near Cairns. The number of species observed at Kuranda was one less than during the previous July and call for very little comment, as the only species caught, that I had not seen alive before were *Z. alsulus* and *R. simsoni*. The most common butterfly was *A. andromacha*, of which I was enabled to get many specimens covered with dew in the early mornings before the sun had warmed them sufficiently from the cold of the previous night. Many hundreds of eggs of this species were found upon the young leaves of the *Grenadilla*. A feature amongst the butterflies at Kuranda was the large number of species of "whites" and "yellows" and I was fortunate in obtaining two specimens of *T. smilax*, which as far as I am aware had not been recorded from Kuranda before. My opinion of the collecting at

Kuranda during the winter months of June and July is that it is not nearly so good as at the sea level near Cairns where the temperature during day and night is considerably warmer.

Whilst I did not succeed in obtaining more species at Kuranda than during July, 1910, at Cairns, though my time was much shorter, I obtained 22 further records and saw 10 species that I had never seen in life before.

At Cairns the genus *Euploea* was represented by four species, all of which were found amongst swampy ground, usually flying over the water and settling head downwards on the tree trunks. *P. egipius* was found wandering along the scrub tracks and the female was caught in the dense scrub itself. Many butterflies were caught in small openings in the scrub where the sunlight only occasionally penetrated. The males of *P. joesa* were easily attracted by pinning an old specimen with open wings on a shrub. The bright blue colour attracted the attention of any passing specimen which would proceed to investigate and hover over the dead specimen for a second or two, when a sharp stroke would capture it. *P. ligatus* I found rather difficult to catch as they would linger, but a second over a *Lantana* flower and unless a short, sharp stroke were made the specimen would escape. In my previous account I mentioned that *Delias nigridius* was not found below the range. This is incorrect, as it was present at Cairns in perfect condition. *A. propinqua* and *H. alimena* were species I had never seen alive before and their gay colours and rapid flight enlivened the scene. Again, *C. chrysippe* forced itself on my notice owing to its conspicuous colouring. This is undoubtedly one of the most attractive of the larger butterflies of the North. *T. euphorion* was present in some numbers and could easily be recognised from a great distance by its size and slow flight. It is a question as to the use of the brilliant colouring of the upper side of the genus *Arhopala*, for though they stand out so conspicuously in the cabinet, their shy habits in their native haunts make them very inconspicuous. They rarely fly unless disturbed, but sit on the shrubs with only their dark undersides visible. I noticed that they very frequently were disturbed from Mango trees.

I had an opportunity of watching two different sets of so-called mimicry and my view was considerably strengthened that these resemblances are due to similar conditions and not brought about by any benefit the mimicking species might obtain. Though I was well acquainted with *Danais petilia* in nature, I had never seen the female of *H. misippus* alive

until I saw one flying down a street in Townsville in July, 1910. I at once saw it was not *D. petilia* and its subsequent capture proved my surmise was correct. Though I saw and caught many specimens of both these species during my two trips and always made a point of making a mental determination of the species when seen, the subsequent capture always proved my determination to be correct. The same occurred with *Tellerio zoilus* and *Neptis staudingereana*, both of which were new to me alive. The flight of these is considerably different, and as it did not deceive an entomologist I cannot think it would deceive a bird.

Skippers were not plentiful except those species that are found amongst the grass, *Imperata arundinacea* so common along the railway line. I was fortunate at Cairns in discovering a new species of skipper since named *O. affinis*. Though marked like *O. marnas* its habits and flight are much different; but for the field observations drawing my attention strongly to it, I would have considered the species nothing but a small *O. marnas*.

My week's stay at Kuranda and Cairns yielded together a total of 87 species, which, considering that the time was the middle of winter, shows that in this district a few months earlier would be very prolific.

Again I was most hospitably treated by Mr. and Mrs. Dodd and their family.

A day's collecting at Townsville on my way South yielded a surprise in the capture of three specimens of *Mycalesis perseus*, which had hitherto only been recorded from Cooktown and Cape York. Dr. Turner a few weeks later took this species on Magnetic Island. Larvae and pupae of *Corone trichopepla* were found on the Cocoanut palm and pupae of *D. argenthona* on *Loranthus*.

After hours in Brisbane only yielded four or five specimens, bringing the total number of species observed on my trip to 91.

The following list of species at the various stations shows that out of 160 records 121 were new to my system of record cards, upon which are entered the monthly records of the occurrence of butterflies for about 30 different stations in Australia. The names and order of species is according to my catalogue published by this Club, except in the case of the *Hesperiidae* where I have adopted the names in Mr Lowers latest revision.

KURANDA (1000 ft.).—*Danais menippe*, *D. affinis*, *D. petilia*, *Euploea corinna*, *Acraea andromacha*, *Junonia albicincta*, *J. villida*, *Precis zelima*, *Hypolimnias bolina*, *H. misippus*, *H. alimena*, *Mycalesis terminus*, *M. sirius*, *Ypthima arctous*, *Hypocysta metirius*, *Cyaniris tenella*, *Danis serapis*, *D. taygetus*, *Candalides erinus*, *Catochrysops platissa*, *C. cnejus*, *Zizera alulus*, *Z. gaika*, *Z. labradus*, *Jamides phaseli*, *Nacaduba lineata*, *N. dubiosa*, *Rapala simsoni*, *Terias hecabe*, *T. libythea*, *T. smilax*, *T. lineata*, *Huphina scyllara*, *Appias ega*, *Delias nigrina*, *D. argenthona*, *D. mysis*, *D. nigridius*, *Catopsilia pyranthe*, *C. lactea*, *C. pomona*, *Troides euphorion*, *Papilio aegaeus*, *P. joesa*, *Eurycus cressida*, *Hesperilla croceus*, *Ocybadistes marnas*, *O. sunias*, *O. walkeri*, *Telicota augias*, *Corone sperthias*, *Chapra mathias*—52 species.

CAIRNS (sea level).—*Danais menippe*, *D. affinis*, *D. petilia*, *D. hamata*, *Tellervo zoilus*, *Euploea eichhorni*, *E. niveata*, *E. tulliolus*, *E. corinna*, *E. sylvester*, *Acraea andromacha*, *Cethosia chrysis*, *Cynthia ada*, *Cupha prosope*, *Atella propinqua*, *Junonia albicincta*, *J. villida*, *Precis zelima*, *Doleschallia australis*, *Hypolimnias bolina*, *H. alimena*, *H. misippus*, *Mynes geoffroyi*, *Neptis shepherdii*, *N. staudingeriana*, *N. consimilis*, *Mycalesis terminus*, *M. sirius*, *Ypthima arctous*, *Melanitis leda*, *Danis serapis*, *D. arinia*, *D. taygetus*, *Miletus narcissus*, *Candalides erinus*, *Lycanesthes affinis*, *Catochrysops platissa*, *Zizera alsulus*, *Z. labradus*, *Nacaduba lineata*, *N. dubiosa*, *N. felderi*, *Arhopala amytis*, *A. eupolis*, *Hypolycaena phorbas*, *Terias hecabe*, *T. lineata*, *T. libythea*, *T. herla*, *Huphina scyllara*, *Appias ega*, *Delias nigrina*, *D. nigridius*, *D. nysis*, *D. argenthona*, *Catopsilia pomona*, *C. gorgophone*, *Troides euphorion*, *Papilio aegaeus*, *P. egipius*, *P. joesa*, *P. choredon*, *P. macfarlandi*, *P. ligatus*, *Eurycus cressida*, *Hesperilla croceus*, *Ocybadistes marnas*, *O. affinis*, *O. sunias*, *O. walkeri*, *Telicota augias*, *T. autoleon*, *Corone sperthias*, *Sabera caesina*, *Parnara amalua*, *Chapra mathias*, *Noto-crypta feisthameli*—77 species.

TOWNSVILLE.—*Danais menippe*, *D. affinis*, *E. corinna*, *A. andromacha*, *J. albicincta*, *J. villida*, *H. misippus*, *M. leda*, *Mycalesis perseus*, *Polyommatus boeticus*, *Z. labradus*, *T. hecabe*, *C. pomona*, *D. argenthona*, *P. aegaeus*, *E. cressida*, *Corone trichopepla*,—17 species.

BRISBANE.—*D. menippe*, *E. corinna*, *A. andromacha*, *H. bolina*, *J. villida*, *M. leda*, *P. boeticus*, *Z. labradus*, *Lucia lucanus*, *D. nigrina*, *D. argenthona*, *T. hecabe*, *T. libythea*,—13 species.

BOTANY THROUGH THE CAMERA.

(Abstract.)

(By W. M. CARNE.)

We call our Club the Naturalists' Club. A naturalist may or may not be a specialist. His distinguishing characteristic is a wide interest embracing all Nature, which, in all its forms, he realizes to be the manifestation of that most wonderful of all things, life. He is a student and lover of life and the tools of his craft are the "seeing eye and the understanding mind." The greatest of scientists are naturalists. Too many of us in Sydney who make natural history our hobby, particularly the botanical workers, are neither scientist or naturalist enough. The bird lover, the geologist, the student of insects and aquatic life are seldom satisfied with a name. To them the life of the organism studied is of importance. They want life histories and cannot escape the recognition of the inter-relations of the different branches of science, the unity of life. How many of our botanical workers, of course excluding those who have made botany their profession, are able to tell you anything of the lives of the plants they collect? Can they trace you their history from generation to generation, or tell you of their relations with the soil, and rain, and wind, and sun, and altitude, the insects, the birds, animals and even man himself? How many do no more than collect to build up an herbarium and to get a nodding acquaintance with as many plants as possible? The end and aim of botany is a knowledge of the life of plants. Systematic botany is not for the average nature-lover, but for the specialist. Collecting without a sufficient purpose is of value only as the collector keeps the specialist provided with material, saving that indefinable something that enters the lives of most people who meet nature on friendly terms. The naturalist gets this and more. He is a worker, a seeker after knowledge. He is productive. Let us instead follow in the steps of men like A. G. Hamilton, R. H. Cambage, C. T. Musson and others. They are the pioneers with us of a larger, fuller, and more satisfying field for the lover of nature. Little has yet been done, whilst the field is immeasurable. The workers are few, and welcome recruits. Each works in the spirit of the explorer seeking where much is to be found. And what matter if one attains to where another stood before. 'Tis confirmation and the discovery is still his. There is room for many explorers to add

their contribution to the map, whose outlines we are now commencing to fill in.

Collect, if we will, for a purpose that in time we approach so near to finality to say, "This is so, I know."

If one could only gather together from the brains of the farmers and others all they know of the relation between plants and soil value! Dr. Jensen has shown that except by trial there is no better indication of the value of a soil than the trees upon it. Many can help to collect accurate data. Collect plants according to the conditions which determine their presence and growth. Determine the influence of geological and meteorological conditions, why certain plants are here and not there. Study the community life of the bush and of the relations of plants to other life. Learn the weeds and why they are so, the useful and harmful grasses, herbs and trees. Collect seeds and fruits and study their development, distribution, germination, etc.

Take a small district and fix definite boundaries, and on it attempt to make—

1. A census of all plants, showing flowering, fruiting and growing seasons.
2. A classification of the plants according to the sets of environmental conditions under which they are growing.
3. Trace how the communities were formed, where the plants came from; the adaptations of the communities and of the individuals composing them.
4. Trace the changes due to man's interference.

To illustrate the object of this lecture numerous lantern slides were thrown on the screen illustrating work that has been done, or as suggestions for investigation. Such points were:—

The fertilisation of *Stylidium* and *Grevillea*.
 Fruit development of *Sterculia*.
 Shy-seeding in *Banksia* and *Callistemon*.
 Seeds that need bushfires for germination.
 Fruit and leaf variation in the *Proteaceae*.
 Polycotyledony in *Persoonia*.
 "Piping" in Australian hardwoods.
 Effect of soil, water, aspect on vegetation.

The following floras being illustrated:—Sydney sandstone, Sydney shale, Blue Mt. shale, sandstone gullies, and sandstone heights, basalt, Grose Vale limestone, North Coast basalt.

Adaptation against intense light and dry conditions. The occurrence of *Casuarina stricta* on the Narrabeen shales (Mr. Cambage's classical paper).

Those to whom this class of botany is new might find much to attract them in an excellent though non-technical work, entitled "Botany of To-day," by G. F. Scott Elliott. Its opening paragraph is suggestive and appropriate.

"The Botany of to-day is a vast subject, and intricately connected with almost every art and craft that man has ever invented. It is also an infinitely varying and complexly developing science, dealing not merely with the discoveries of mankind, but with life itself."

NOTE ON THE SALT WATER MOSQUITO.

(*Culex vigilax*, Skuse.)

(By Miss Gladys H. Froggatt.)

We spent our recent holiday at Cronulla on the cliff towards Port Hacking. While there my attention was drawn to the rock pools on the cliffs just above high water mark. These pools were filled, apparently by salt water spray, and were alive with mosquito larvae and pupae in all stages of development. The rock pools below high water mark, and which were covered at every high tide, contained no mosquitos. On the top of the cliff there was a freshwater pond several feet in depth, overgrown with water weeds and bushes, which was filled by the soakage of the hill over the sandstone; and though this fresh water trickled over the rocks and formed other rock pools of freshwater there were no mosquito larvae in either the waterhole or overflow.

When these larvae were brought home they were divided into two lots: One half was put into seawater from the harbor at Circular Quay; the remainder was put into fresh water drawn from a tap. The larvae seemed equally happy and at home in the fresh as in the salt water.

In the fresh water pond and pools on the cliffs were frogs and tadpoles, so that most probably they had eaten the mosquito larvae, and as frogs do not enter salt water the larvae in the salt pools above high water mark would have no

enemies and were therefore so numerous. In the pools below high water mark were some tiny fish which eat mosquito larvae, and these small fish would not be able to reach the higher pools. . . . This species of mosquito was described by Skuse from Gosford, Kiama, and other coastal districts of N.S.W., and Dr. Bancroft has recorded it from Johnstone River, North Queensland. Skuse has made no note of its habits, but, in Theobald's monograph, "*Culicidae* of the World," it is stated that Dr. Bancroft had bred specimens from salt water.

Theobald named the species *Culex marinus*, but he later identified it as Skuse's species (*Culex vigilax*).

NOTES AND COMMENTS.

A RARE DRAGON FLY.—It was my good fortune on the 17th of February of this year to collect at Maroubra a male specimen of *Austrothemis nigrescens*, Martin. This the first record of this species having been taken in N.S. Wales for a period of 60 years. It has, however, been collected in Western Australia. For the guidance of other naturalists I give herewith brief descriptions (kindly drawn up for me by Mr. R. J. Tillyard, M.A., F.E.S.) of the male and female. They are as follow:—"Male: brilliant red abdomen with very conspicuous black triangular markings; also the extreme dilation of the abdomen from segments 3-8. Female: brownish with black markings, and a shorter and thicker abdomen. Wings of both sexes touched at bases with saffroning and also with black. There is no other known dragon fly that comes anywhere near this combination of shape and colour except *Aethriamanta circumsignata*, a rare species from N. Queensland."—A. MUSGRAVE.

At Springwood, Blue Mountains, last November, I observed a wag-tail capture a male specimen of *Heteronympa merope*, pull off its wings and then eat the body.—G. A. WATERHOUSE.

AN AGED ENTOMOLOGIST.—One of the most interesting personalities in respect of living naturalists, is that grand old French entomologist, J. H. Fabre, now in his ninetieth year. Fabre is one of those rare literary and scientific geniuses whose work appeals on one hand to the man in the laboratory,

and on the other, when he treats his subject in a "popular way," to every man and woman who knows what good literature really is. Even a child may understand Fabre, yet he is never puerile. Charles Darwin described him as an "inimitable observer," and although many years have passed since Darwin wrote thus, and this grand old man in entomology is now a nonagenarian, his intellect and natural ability are as keen as ever. In illustration of this, Fisher Unwin are offering a new work by Fabre, "Social Life in the Insect World" (translated by Bernard Miall), and this book should soon be on the Australian market. Doubtless, our members and the reading public generally will look forward to its advent here.

DR. MCCOOK.—In November last, that well-known American naturalist, the Rev. Dr. Henry McCook, D.D., passed away at Philadelphia, U.S.A., at the age of 73. The deceased naturalist was a ripe scholar, and one of the best-known popular writers on biological subjects in the United States. In fact he was to America as a populariser of natural science, what the late Rev. J. G. Wood was to Britain. His writings, both in book and magazine form, are numerous, and they did much to stimulate the study of insect and plant life in the great American republic. One of his best-known popular works is "Tenants of an Old Farm," and excellent reading it is to the boy or girl who are not so stupid as to need to be "written down" to. Indeed, the boy or girl who requires that is hardly worth while bothering about. On the serious side of scientific literature Dr. McCook was an excellent worker, and was most justly held in high repute by systematists in all the great biological centres of the world. The *magus opus* of his life's work in this respect is "American Spiders and their Spinning Work," an extensive monograph consisting of three large quarto volumes, two of which are letterpress (with many text figures), and one of coloured plates, produced with exacting fidelity to nature.

TERATOLOGICAL SPECIMENS.—At a meeting of the Entomological Society of London recently, Mr. G. T. Bethune-Baker exhibited a specimen of *Erebia ceto* which had been swept from the herbage without its head, which was probably held fast by a spider. Nine hours after capture this insect had still been capable of fluttering strongly. He also exhibited a specimen of *Erebia* var. *adyte*, with a half-developed right hind wing; a specimen of *E. criphyle* with no left hindwing, and a *Melitaea cavia* with no right hind wing;

in the two latter here was no trace of the absent wing ever having been developed.

A REMARKABLE BURROWING FROG.—At the meeting on 6th February, Master T. P. Steel exhibited five living specimens—four males and one female—of *Philocryphus flavoguttatus*, Fletcher, from Leura. This is one of the rarer of our Australian frogs and is remarkable for the powerful pectoral muscles. On the three first toes of the fore-limbs of the males are a series of black horny tubercles, which in the specimens shown varied irregularly in number from four to nine on each toe, and constitute a somewhat formidable armament. When taken in the hand the animal has a habit of grasping the finger with a sudden spasmodic movement of the strong fore-limbs and giving a sharp squeeze which is quite painful and must render the frog a formidable opponent to any small animal. An exactly similar habit of an unidentified frog from La Plata, tentatively called the "Wrestler Frog," is described by Hudson in "The Naturalist in La Plata" 1892, p. 76. The figure there given bears a strong resemblance to our Australian frog.—Ed. *Australian Naturalist*.

AUSTRALIAN MISTLETOES.—At last meeting of the Club Mr. E. Cheel exhibited specimens of three species of mistletoe collected by him in January at Burrinjuck:—

Loranthus linophyllus, Fenzl, parasitic on the "River Oak" (*Casuarina Cunninghamiana*, Miq); *L. Bidwilli*, Benth, on "Red Pine" (*Callitris calcarata*, R.Br.); and *Notothixos cornifolius*, Oliv., on "Kurrajong" (*Sterculia diversifolia*, G. Don.) These parasites were very conspicuous as they hung in dense masses on their respective hosts.

INSECT RELAXING BOX.—At the February meeting of the Club, Mr. G. A. Waterhouse exhibited a Newman relaxing tin into which he had placed several butterflies at Cairns dur-

ing the previous June. The specimens were quite free from mould or decomposition, yet they were in a sufficiently soft condition for setting. It was pointed out that by using one of these tins, which have been imported by Messrs. E. Cherry & Sons, specimens may with great ease be kept as pliable as if freshly caught and thus the trouble of setting immediately on ones return home after a tiring day's collecting is avoided.

ROBBER FLY AND BEES.—I have frequently noticed one of the flies of the family *Asilis* catching honey bees. The bee was pounced upon from above and held by the fly so that it could not use its sting. The fly pierced the bee at the back of the thorax and quickly sucked it dry. On Friday last, 22nd March, I was able to secure the fly with a bee which it had caught. Mr. Froggatt has identified the fly as *Asilis murinus* and the bee as the common hive bee *Apis mellifica*. In "Australian Insects" only an American species is mentioned as attacking bees, and it is interesting to find that an Australian species has also acquired this destructive habit.—Tom Guthrie, Burwood.

EXCURSION.

MR. FINCKH'S AQUARIUM.—On Saturday, 9th March, Mrs. and Mr. H. E. Finckh were "at home" with the members of the Naturalists' Club. About forty members attended and spent a most enjoyable afternoon. The aquaria work, especially the salt water aquaria, proved of great interest. Refreshments were served on the lawn and members left expressing their sincere thanks to Mrs. and Mr. Finckh for their kindness and hospitality.

THE
Australian Naturalist.

VOL. II.

JULY 2, 1912.

PART II.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

2nd April, 1912. Ordinary monthly meeting, Royal Society's House, Mr. E. Cheel (President) in the chair. Misses N. Hudson, J. M. O'Dea, and M. J. Wells, and Mr. E. Breakwell were unanimously elected members.

The business was an exhibition evening, and the following exhibits were shown:—Mr. Froggatt, a series of beetles and weed weevil from Aru Islands; Miss Brown, a miscellaneous collection of insects from Corowa; Mr. T. Steel, fresh examples of two balloon vines, *Cardiospermum hirsutum*, Wild, a native of Guinea and W. Coast of Africa; and *C. Halicacabum*, Linn. the Queensland Heart-pea or Balloon Vine, a plant found in most tropical countries. It is indigenous to Queensland, but does not occur as far south as N.S. Wales. Is easily grown about Sydney, and forms a handsome creeper for trellis work. A supply of seed was provided for members. Mr. Steel also exhibited a living specimen of a pretty little Ghecko, *Diplodactylus vittatus*, Gray. Mr. Wickham, life history of three Liparidae moths, also a collection of 32 species of moths caught during last summer in his bedroom, at Mosman. Miss Mabel Brewster exhibited a wasp *Polistes Tasmaniensis*, with its cell, and read a most interesting note on the artificial feeding and development of the larvae. Miss Froggatt read a note on a collection of flies attracted by ripe grapes. Mr. Luke Gallard exhibited and described a collection of insects, mainly parasitic wasps, friendly to the orchardist. Mr. G. A. Waterhouse, a very fine collection of skipper butterfly flies. Miss Brewster, ant-lion. Mr. Fine, dermal skeleton of Pipe-fish. Mr. Horne, collection of characteristic W. Australian flowers. Master Oliver Edwards, life history of a Papilio. Mr. Cheel, a series of plants illustrative of symbiosis, as described in his paper. A paper on Variation in *Lambertia formosa*, by Dr. Lovell, was read by the author.

7th May, 1912. Mr. E. Cheel in the chair. The President announced, on behalf of Miss Rothwell, that it was proposed to organise a party to visit Melbourne at the end of the

year in connection with the meeting of the Australasian Association. An interesting address, illustrated with lantern slides and models, on Plant Hairs, was delivered by Mr. McKinnon, B.Sc. The exhibits were, a collection of insects from Brownsville, Miss Brewster. Mr. Finckh, fruit of *Monstra deliciosa*. Master Oliver Edwards, *Paropsis*, collected on Eucalypts around Sydney.

SYMBIONTS.

By E. Cheel.

At the meeting on 2nd April, Mr. E. Cheel exhibited a series of interesting specimens of plants which live in combination for mutual benefit, a relationship known by the Greek term "Symbiosis." *Parmelia* sp. Probably *P. reticulata*, Tayl. A large foliaceous lichen measuring $16\frac{3}{4}$ by $13\frac{1}{2}$ inches across, taken from off a sandstone rock at Wiseman's Ferry. This specimen, it was explained, was not a simple plant in the true sense of the term, but a complex combination of two individuals—a symbiosis of an Algae of the *Protococcus* family and a Fungi.

This form of symbiosis was first brought under notice about 50 years ago, by De Bary, who when working on fungi and studying the nature of lichens, suggested that the latter were either the perfectly developed forms of certain elementary green plants, or algae which had hitherto been recognised only in an early stage, or that those algae assumed the form of lichens when they were attacked by a fungus. About 10 years after this hint was given, the matter was followed up by Dr. Schwendener, a German botanist, who pretty clearly showed that lichens were dual organisms, a symbiosis of Alga and fungus.

Another example of symbiosis was shown in a series of root nodules, comprising a Wattle *Acacia longifolia*, Pidgeon Peas (*Cajanus indicus*), French Beans (*Phaseolus vulgaris*), Flower Bean (*Phaseolus* sp., probably *P. calcaratus*), Bay Bean (*Canavalia obtusifolia*) and *Glycine clandestina*.

These little nodules scattered on the roots of the leguminous plants mentioned above, are what might be termed colonies of living bacteria, which flourish in the living cells of the roots, not injuring the plants, but, on the contrary, acting as suppliers of nitrogen, which is used by the host plants; thus an advantageous attachment and co-operation exists between the higher plant and these micro-organisms.

Specimens of *Boletus granulatus*, a fungus somewhat resembling a mushroom in shape, but having sulphur-colored pores or tubes on the under surface instead of gills; and *Rhizopogon luteolus*, a peculiar fungus, somewhat like a puffball in shape, but always found just under the soil instead of on the surface, were also exhibited, and it was suggested may probably be another example of symbiosis, as both these species are found under pine trees, especially *Pinus insignis*, and have probably been introduced with these species, and symbiotically associated therewith.

It is interesting to note that attention has already been given to *Boletus granulatus*, having been found under pine trees in California, as specimens have been sent, by way of exchange, to the National Herbarium, Sydney, from the Stanford University of Santa Clara County, with the following particulars—"This is apparently the most abundant *Boletus* of this region, but found almost altogether under or near pine trees instead of oaks."

Mr. G. Masee, the Mycologist at the Royal Gardens, Kew, also states in his *British Fungus Flora*, vol. i., p. 280 (1892), that *Boletus granulatus* is found "amongst grass under trees, especially firs."

ON FLIES FOUND ATTACKING RIPE GRAPES.

(By Miss Gladys H. Froggatt.)

I collected these flies under a grape vine trellis in our garden at Croydon. Just when the grapes became fully ripe, we had a lot of rain, which caused many of them to crack and begin to decay. These rotting bunches attracted the honey bees, and also large numbers of flies. There were so many different kinds of flies that it seemed worth while to collect and classify them. To simplify the difficulty of netting the flies among the hanging fruit, bunches of over-ripe grapes were placed on a table under the trellis, and there the flies, which immediately clustered over the fruit, were easily secured with a net. Among the specimens obtained, the following species have been identified:—

Apis mellifera.—The common honey bee.

Musca domestica.—The ordinary house fly which Dr. Howard calls the "typhoid fly" because if allowed it can transfer disease so readily.

Sarcophaga aurifrons.—The best known species among the "flesh flies." It is one of the commonest of those large flies which decaying matter always attract.

Calliphora oceaniae.—One of the smaller "blow" flies. The brilliance of its steel blue body with the patch of dull yellow on either side, gives it a striking appearance.

Calliphora villosa.—A large common yellow house "blow fly." Its body is covered with golden pubescence.

Calliphora tibialis.—A "blow" fly not previously noticed about the house. It looks like a small, dull colored form of *Calliphora villosa*, but is quite distinct.

Lucilia sericata.—The metallic "blue bottle" fly. It is the common English "blue bottle" fly, which is very fond of meat.

Pegomyia rufipes.—Looks like *Musca domestica*, but has distinctively spotted wings. One species is a pest in California, on the sugar beet.

Chrysomya melanops.—

ON THE ARTIFICIAL REARING OF POLISTES TASMANIENSIS.

(By Miss Mabel Brewster.)

On March 3rd I found an intermediate sized nest of the wasp *Poliste Tasmaniensis*, at the Army Reserve, Clifton Gardens. There were two eggs in some of the cells, while others contained one only, and in others again there were a total of ten larvae. The adult wasp having been killed, I tried feeding the larvae with Allenbury's Food, a partly digested food, using a whip of straw for the purpose. When drops of food were offered, some of the larvae fed greedily, and would take food as often as it was offered, others would take only a little at a time and not often. After a few meals the larvae developed rapidly, and some were ready to pupate. When the nest was captured there were a few pupae in it, and these soon began to hatch out. One wasp which so hatched took food while resting on my hand. I then put the nest in the open tied to a branch of a shrub, but as ants crawled to it, I removed it indoors again. A few days later I noticed that the adult wasp had a large object in its mouth, which proved to be one of the larvae which it had killed and was eating. I hunted the wasp off and it flew away and did not return. Another wasp hatched out and began to feed the larvae, but about the third day it had taken one of the larvae out of its cell and bit its head off. I kept the insects a fortnight on Allenbury's Food, when the nest was accidentally lost. I tried feeding the larvae on honey, but they did not seem to like it.

LAMBERTIA FORMOSA.

A PARTIAL STUDY IN VARIATION.

By H. Tasman Lovell.

The character examined in this study was the number of component flowers. In all 354 examples were dealt with in one day, the locality being French's forest and the time the early part of February, 1912, at the close of a dry spell extending over seven or eight weeks. The results may be arranged in a frequency table as follows—

No. of Component Flowers	6	7	8	9	10	11
Frequency	1	346	1	3	2	1

It will at once be noticed that 7 is the *normal*. It will also be remarked—and this would not easily be revealed to the casual observer—that there is a fairly wide range of variation in this character, especially above 7.

The exact extent of the variation within the limits of the number of cases examined may now be figured out thus:

No. of Component Flowers.		Frequency.	
6	x	1	= 6
7	x	346	= 2422
8	x	1	= 8
9	x	3	= 27
10	x	2	= 20
11	x	1	= 11
		<hr/> 354	<hr/> 2494

Therefore the arithmetic mean = 7.045 Compt. Flowers.

The deviations of 6, 7, 8, 9, 10, 11 from 7.045 is now taken:

Deviations.		Frequency.	
—1.045	x	1	= 1.045 (neglecting the
— .045	x	346	= 15.570 negative sign)
.955	x	1	= .955
1.955	x	3	= 5.865
2.955	x	2	= 5.910
3.955	x	1	= 3.955
		<hr/> 354	<hr/> 33.300

Thus the mean deviation = .095 roughly .1 compt. flowers.

Therefore while 7.045 may be viewed as the *type*, .095 represents the average extent of deviation from the *type*, i.e., of variation. This will scarcely be regarded as a considerable variability, yet it may be of interest to those who have not previously observed its presence at all.

Incidentally it was noticed that another character was exhibiting slight variation. As is well known the leaves and sepals of this species arrange themselves about the stalk in whorls of *three*. In two of the cases having 9 component flowers, the leaves below the flower and the sepals of the flower itself appeared in whorls of *four*. It might be that further investigation would lead to the establishment of a *correlation* between the variation of the two characters.

The relation of the above to the study of evolution will be apparent, and may serve as a very inadequate indication of the way in which the application of statistical methods to biological inquiry may reduce much that is vague to accurate statement.

EXCURSIONS.

Easter Excursion, Brownsville.—Those of us who were so fortunate as to leave Sydney at midday on Thursday, 4th April saw the far flash of the sea in the afternoon sunlight and the deep purple shadows at the foot of sea cliff and mountain slope, as we journeyed to Brownsville. When we alighted at Kembla Grange, a benighted little railway platform the Sydney side of Dapto, we looked around on a scene of distinctive beauty. The purple shadows in the hollows of the green hills which flow in undulating lines from the mountains to the sea, the shining river which winds its way through Brownsville and the surrounding farms, the little village with its aggressively red church spire and over all the purpling mountain range all combined to make a picture of unusual beauty. Certainly, we had chanced on a land flowing with milk and honey, and a veritable land of promise to the artistic soul. But we, like Karshish, were "pickers up of learning's crumbs," and as naturalists looked out on it with other eyes besides those of the artist. Around us was the silent record of geological ages. In the creeks and amongst the scrub the Entomologist would find something of interest, by Lake Illawarra, which shone like silver in the distance, the Ornithologist might hope to be rewarded for his journey, and the Botanist's success was plainly assured. It was a long level road to Brownsville village, and a longer one to the boarding house beyond, and the muscular brother naturalist who made the secretary his debtor by carrying a large share of his camp equipment has his name most favorably recorded with the gods. Perhaps notwithstanding our scientific research many good spirits still haunt the shady slopes and secluded spaces of that lovely landscape, and create an atmosphere of kindness and goodwill!

The protection of a tent sufficed for four souls who desired to dwell for four days near nature's heart, for the others the hotel at Brownsville provided some with accommodation, while a boarding house a mile away made the remainder most comfortable. *Good Friday* was devoted to a drive to the summit of Mount Kembla, and a few hours collecting there. The party, which numbered about 45 had a very delightful day, and, socially as well as scientifically, the excursion was certainly a distinct success. Though the Entomological collection was not great, the Botanical section did extremely well. After dinner on the evening Mr. Cheel and Mr. Gurney described the specimens collected, the lecturettes proving a great success.

Saturday, though very clear and fine, proved to be a wild, windy day. The members of the party were taken by launch down Lake Illawarra to Gooseberry Island. The intended destination was the entrance to the lake, but the wind was too boisterous to permit it. The collecting on the island was good, the Entomologists securing a large number of specimens, while the botanists had a good day. The wind fell towards sunset, and the return home across the lake was a very pleasant one.

Sunday morning was uneventful, most of the party preferring a quiet time. Some of the entomologists secured good specimens in the creeks toward Dapto. In the afternoon one party went down to the Lake and another to Mount Brown; both were very successful. *Easter Monday* was a splendid day, and the members followed the devices of their own hearts. Some collected water insects, others went for walks in the neighbourhood. The afternoon saw a general break up of the party, and a safe return to Sydney after a delightful holiday.—E.S.E.

Site of New Zoo.—The excursion on *Saturday*, 11th May, was attended by about 50 members, who met at Musgrave Street Wharf, Mosman, and walked through the site of the new Zoological Gardens towards Bradley's Head. Mr. Cheel led the party, and a collection of plants was made on the Zoo area, together with some notes on the birds seen there. Mr. Le Soeuf gave a most interesting account of the manner in which it is intended to construct the new Zoo buildings, and arrange the walks and cages. The site was admitted to be unique, and the proposed arrangements, if carried out, will be worthy of the finest zoos in the world. He also showed the position of the Zoo Aquarium. The members partook of afternoon tea at Athol, and then inspected the magnificent view from the highest site of the new Zoo grounds.—E.S.E.

NOTES ON THE FLORA COLLECTED DURING THE EASTER EXCURSION.

(By Edwin Cheel.)

Proceeding along the road from Kembla Grange to Brownsville and Lake Illawarra, the undulating country, which the settler has converted into pasture—land and cultivation—paddocks is seen to be almost denuded of trees and shrubs, but there is still some evidence that this picturesque part of the south coast district must formerly have been very fine forest areas, as there are a few living specimens of eucalyptus and angophoras, as well as a number of ring-barked ones, which convey to the mind of the observer some idea of what previously occupied the land. Although the land has been considerably changed from its natural condition, a small patch here and there was noticed in which there are also a few smaller plants left and sufficiently interesting to attract the attention of naturalists:

In the water channels or mud flats along the roadside, quite a number of tiny plants of *Cotula reptans* was found, and along the embankments of Mullet Creek, some large shrubby plants of *Commersonia Fraseri* were noticed. *Cyperus trinervis*, a Cyperaceous species, and *Juncus homalocalis*, a member of the rush or Juncaceae family, were also very plentiful in the district. Quite a number of native grasses were seen, including one of the so-called "Windmill Grass," *Chloris truncata*, the "Pitted Blue Grass," *Andropogon pertusus*, the "Hairy or Silky Blue Grass," *A. sericeus*, as well as *A. affinis*. This latter species, of course, is quite common. Two exotic species which appear to be taking possession are *Pennisetum longistylum*, a native of Abyssinia, and a "Pidgeon Grass," *Setaria imberbis*. Both these species are regarded as very poor quality from a pastoral point of view, the former, in fact, is rather a pest, while the latter is a weed very similar in appearance to *Setaria glauca*, which is given as a native of this State, but is distinguished by the longer and more slender spikes, as well as some other minor structural differences. In addition to the sedges, rushes, and grasses mentioned, there were quite a number of other flowering plants collected, as well as some interesting specimens of the cryptogamic or non-flowering section of the vegetable kingdom.

The most noteworthy of the latter are some fine specimens of *Lepiota procera*, a species belonging to the Agaricaceae, which are sometimes called "toad-stools." These are similar in shape to the common mushroom, *Psalliota campestris*, which was fairly plentiful in the district, but may be distinguished by the longer stems, whiter gills and the movable ring or annulus around the stem.

Some very fine specimens of *Calvatia lilacina* and *Mycenastrum corium*, two species belonging to the "puff-ball" or Lycoperdaceae family, were also collected, as well as a few specimens of *Bovistella aspera*. This latter species is also one of the "puff-ball" family, and very closely resembles the genus *Lycoperdon* or true "puff-ball," which are popularly called "Devil's Chimney Pots," on account of the spores coming out of the little mouths at the apex, resembling smoke coming out of a chimney pot. This is especially noticeable when the dry plants are squeezed or kicked with the foot.

LAKE ILLAWARRA.

Along the shores of Lake Illawarra in fresh and salt water marshes, quite a number of interesting plants were collected, including *Sporobolus virginicus*, *Paspalum distichum*, *Triglochin striata*, *Cyperus polystachys*, *Scirpus nodosus*, and *Juncus maritimus*.

Three creeping plants with purple or pale bluish coloured flowers were very plentiful, there are *Selliera radicans*, a Goodeniaceous species, *Mimulus repens*, one of the Scrophularineae and *Lobelia anceps*, one of the Lobeliaceae.

The leaves of *Selliera radicans* were very badly infested with the accidio spore stage of a fungus disease, *Puccinia*, probably *P. Saccardoi Atriplex patula*, *Suaeda maritima*, the common "Sea Blite," as well as *Salicornia Australis* and a *Chenopodium*, sp., all members of the Chenopodiaceae or salt-bush family were in flower, and were specially interesting to some of the members, who had not previously seen these plants.

MOUNT KEMBLA.

On Good Friday, the members were taken for a trip to Mount Kembla.

The journey commenced from the boarding house near Lake Illawarra, and as the two large drags were drawn by five and four horses, respectively, and as they were very fit, the journey through the undulating country, via Brownsville and Kembla Grange, proved to be a very enjoyable one.

Soon after passing Kembla Grange platform, a large patch of wild rose bushes, with pure white flowers, attracted our attention. These were examined the next day, and proved to be quite distinct from the common "Sweet Briar, *Rosa rubigenosa*, which was also found growing alongside, but in lesser numbers, and turned out to be *Rosa turbinata*, a

species found wild in Germany, but not previously recorded as a wild plant in Australia. It is also interesting, because it is not even found represented in the collection grown in the Botanic Gardens. We were not very long on the road before a change of vegetation was noticed, for as we ascended the Mountain the brush forests became gradually thicker and also the various species of eucalyptus and wattles were more prominent.

The most common eucalypts were *E. eugenoides*, *E. botryoides* and *E. pilularis*, and of the wattles *Acacia decurrens* and *A. Maideniana* were the most common.

In the deep gullies of the mountain slopes several specimens of *Panax Murrayi* could be distinguished, as the long, straight, slender trunks are very noticeable with the tuft-like head of large pinnate leaves, and gives an additional charm to the vegetation when seen mingled with the numerous ferns, including the "Tree Fern," *Alsophila australis*, as well as the "Cabbage-tree Palm" *Livistona australis*, which were fairly abundant.

Several small trees and shrubs such as *Cargilla australis*, *Trochocarpa laurina*, *Sambucus xanthocarpus* and *Synoum glandulosum* were specially interesting to the members, who had not previously had an opportunity of inspecting these plants. Some smaller shrubs were also noted, the most common being *Leucopogon lanceolatus*, with very large leaves up to 3½ and 4 inches long, and of a beautiful pale-green verdure, and the native "Raspberries," *Rubus rosaeifolius* and *R. Moorei* were also very common.

Psychotria loniceroides, a small shrub belonging to the family Rubiaceae, was quite common, and looked very pretty, as the branches were heavily laden with yellowish succulent berries. These are not often seen in such a good state as this, as they soon dry, and become striated or ribbed when dry. *Persoonia mollis*, *Drimys dipetala*, *Pomaderris apetala*, *Pittosporum revolutum* were all fairly common in the gullies or on the slopes of the mountain. Two grasses were very common, namely, *Oplismenus compositus*, and a matted grass *Panicum pygmaeum*.

Several interesting species of lichens were seen, the most common being *Parmelia cetrata*, var. *sorediifera* and *Physcia* species and *Cladonia* sp., not yet worked up, as well as a fungus-like lichen known as *Bacomyces fusco-carnea*.

Some fungi were also collected, the most common being *Thelephora terrestris* (?), *Hirneola polytricha*, the "Jew's Ear Fungus," and a large phosphorescent species of Agaricaceae, probably *Pleurotus candescens*, as well as a minute pure white agaric, which is probably a *Marasmius*, sp.

GOOSEBERRY ISLAND.

The name "Gooseberry" is very appropriate for this island, as the "Cape Gooseberry," a South American species known to botanists as *Physalis Peruviana* and belonging to the family Solanaceae, occurs in abundance.

The island is rich in brush plants, the most conspicuous being the "Giant Nettle Tree," *Laportea gigas*, *Hibiscus heterophyllus*, *Myrsine variabilis*, *Evolvella micrococca*, *Ficus stephanocarpus*, *Phyllanthus*, *Gastroemii*, *Breynia*, *oblongifolia*, and some very fine trees of the "native plum," *Podocarpus elata* and the "Black Apple," *Achras australis*, *Elacodendron australe*, *Albizzia prunosa* and many other large shrubs and trees.

The largest trees seen on the island were some magnificent specimens of *Ficus rubiginosa*, commonly known as the "Port Jackson Fig." In the forks of these were some fine clumps of the "Elkhorn Fern," *Platycerum alcicorne*. Several climbing plants were also noticed, the largest being *Palmeria scandens*, a vigorous climbing shrub with very stout branches, of the family Monimiaceae, and also some strong twining plants of *Lyonsia straminea*, *Stephania hernandifolia* and *Geitonoplesium cymosum*, as well as an introduced climber *Senecio scandens*, which belongs to the family Compositae, and commonly known as "Cape Ivy." Some specimens of a *Solanum violaceum*, a pretty bluish-flowering species, was also collected by one of the members. A number of smaller plants were very plentiful on the island, the most conspicuous being *Commelina cyanea*, a trailing plant with bluish flowers, *Eranthemum variabile*, and *Plectanthus parviflorus*, as well as three species of obnoxious plants, *Urtica incisa*, the stinging-nettle, *Nyssanthus erecta*, a plant with axillary clusters of flowers supported with spinescent bracts and bracteoles, as well as *Bidens pilosa*, which has achenes with rigid retrose hispid bristles, which hang into one's clothes.

There were two grasses very common on the island, one was *Microlaena stipoides*, the "Native Rice Grass," and a broad and narrow-leaved form of *Oplismenus composita*.

A number of extremely interesting lichens was seen on the trunks of several of the trees, but as the time was so limited, only a few were collected, which includes *Ramalina Eckloni* var., *Usnea* sp. near *U. scabrida*, two species of *Lecidea*, and some beautiful specimens of *Glyphis*.

Of fungi, the most common species were as follow—

Guepinia spathulata, *Trametes ochroleuca*, *Peniophora*, sp., and two species of *Polystictus*.

NOTES AND COMMENTS.

Parasitic Wasps.—An interesting collection of parasitic wasps ranging from the small red Braconid, bred from the pupae of the Queensland Fruit Fly to the large Megalyridae parasitic on the larvae of longicorn beetles, &c., was exhibited at the April meeting by Mr. L. Gallard. Living examples recently bred were shown of a red Braconid wasp bred out of Queensland fly larvae from Gosford; the scented, sticky *Pimpla* wasps from the hairy caterpillars which defoliate quince trees; striped *Pimpla* wasps from Tie-tree sawfly larvae. One very fine black Megalyridae had a body length of one inch and ovipositor three-and-a-half inches long; it was found at Dungog.

Liparididae Moths.—Mr. C. H. Wickham's exhibit at the April meeting comprised the life histories of three Liparidae moths. The first was *Teia anartoides*, which is at times a pest in our gardens and orchards, the larvae eating the leaves of the geranium and apple. They are light brown and hairy, with four distinctive tufts on the back. They pupate on the leaves, forming a loose cocoon of their own hairs. The female moths are wingless, dark brown in colour, and never crawl far from the cocoon, but simply lay their eggs and die. The males are gay little moths with black and brown forewings, and orange with black bordered hinder wings. The second (name unknown), was found feeding on the leaves of the grass tree. A black, hairy caterpillar two inches long, which pupated just beneath the surface of the ground in a cocoon much firmer than that of the preceding species. The female adult is also wingless and black, and after laying shrinks to half original size. Eggs are white with dark brown band, three quarters of the way round. The male is a pretty buff insect, with very feathery antennae. The third was "*Ocinara Lewinae*," the larvae of which live in a web at the foot of young eucalyptus saplings, the leaves of which they eat at night and retire to the web in the daytime. In some parts these webs are so numerous that horses eating them with the grass die from the effects. The larvae are not nearly so hairy as the others, and are light brown, with a circular white spot on both the head and tail. They pupate under ground in a cocoon, to which the adjacent earth adheres. Both adults have wings. The male is light brown with darker markings, and the female a dark slaty brown all over, with a very pronounced tuft of hair at the extremity of the abdomen.

Several reports held over.

THE
Australian Naturalist.

VOL. II.

OCTOBER 1, 1912.

PART 12.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

EDITORIAL.

The arrangements for the amalgamation of the N.S. Wales Naturalists' Club with the Flora Society, which have been going on for some time past, were happily completed at the joint annual meeting on 6th August. The society now assumes its new title, The Naturalists' Society of New South Wales. It will be remembered that at the annual meeting on August 1st, 1911, Mr. Gurney pointed out the advantages to be gained by such an amalgamation, and it must be a source of satisfaction to that gentleman to see how successfully the idea has been carried out.

The interests of the two societies were very much in common, and the amalgamation will make for consolidation and be greatly to the benefit of the members.

The subscription has been fixed at a very modest sum, and all members will receive free the *Australian Naturalist*. It is specially desired that members should contribute notes of their observations, at the meetings, for subsequent publication. Recent numbers of the journal have contained such notes—particularly those by some of our lady members—which are really valuable contributions to the records of science.

ORDINARY MEETINGS.

4th June, 1912. Monthly meeting, Royal Society's House, Mr. E. Cheel (President) in the chair. Mr. and Mrs. Harry Burrell and Mr. C. B. Fidler, B.A., were nominated for membership.

Mr. E. F. Hallman, B.Sc., delivered a lecture on Sponges which was illustrated by numerous lantern slides and specimens. Miss Froggatt read a note on the Indian Wax Scale, *Ceroplastes ceriferus*, and exhibited specimens. Mr. C. H. Wickham showed a pair of Liparid moths, *Darala chelepteryx*, and gave some information on their life history.

ANNUAL MEETING.

6th August, 1912. The last annual gathering of the Naturalists' Club was the first meeting of the Naturalists' Society of New South Wales, for on this occasion the old club and the Flora Society completed their amalgamation. It was a crowded meeting. The hall of the Royal Society, however, was not filled with specially invited guests, but with those interested personally in Natural History. From the moment the President opened the meeting to the final act of the evening, when the new President was welcomed to the chair, everything moved forward with a sense of confidence that comes from a belief in assured success. There was an atmosphere of goodwill and friendliness, combined with a sense of satisfaction at the success of the year's work, as well as confident anticipation of much interesting and useful study in the coming year. There was a feeling of strength and ability to do much. The President's address was worthy of the occasion; as he spoke, his audience felt what convincing power there is in a man who has accumulated so much scientific knowledge and observed so widely. The Treasurer's statement showed how financially strong we were, and incidentally exhibited to the discerning how loyally he had looked after the club's interests in the past year; while the annual report was a record of a successful year of work. The first chairman of the new society was welcomed cordially and assured of the hearty co-operation of the Council and members. Mr. E. S. Edwards, M.A., the new President, returned thanks for the compliment of his election. The full list of office-bearers will be found in its usual place. Mr. Cheel's address, an abstract of which is printed in this number, was illustrated by a magnificent display of plant specimens, beautifully prepared, and by a large series of lantern slides. Mr. C. H. Wickham exhibited a living specimen of a rare *Thysanura* ("Silver-fish"), *Allomachillus Froggatti*, found amongst shale on the coast near Newport. The group to which it belongs is interesting, representing as it does the most primitive of living insects.

3rd September, 1912. Mr. E. S. Edwards, M.A. (President) in the chair. Rev. W. W. Watts gave an able address on "Mosses of the Sydney District," illustrating his remarks with an exceedingly fine display of beautifully mounted specimens, herbarium and microscopic.

Mr. Steel exhibited an acorn from *Quercus pedunculata*, growing in the Domain, Sydney, having each cotyledon subdivided symmetrically into two unequal sized lobes, thus forming four distinct cotyledons. This was the only abnormal example noticed amongst many hundreds examined. Also an egg laid by a Muscovy duck having an unusually dark shell, the colour being as dark as that of the Emu.

ANNUAL REPORT, 1911-12.

The past year has been one of marked progress in all directions. Excluding the Annual Meeting, which was a crowded one, the attendance at our meetings has been on an average from 50 to 60; while the attendance at our monthly excursions has greatly increased, so much so that an attendance of 50 is not unusual.

Twenty-five new members have been elected during the year, while six have resigned.

The following lectures have been delivered during the year:—

The Fertilization of Plants, by A. G. Hamilton.

Insectivorous Birds, by W. W. Froggatt, F.L.S., F.E.S. [Mr. Froggatt gave this lecture at very short notice on account of the illness of Mr. Waterhouse. We are indebted to this gentleman for much help during the year.]

Gondwana Land, by W. S. Dun,

Botany through the Camera, by W. B. Carne. [This gentleman was too ill to finish the lecture, and it was repeated to a large audience in March.]

Some more Butterflies of North Queensland, by G. A. Waterhouse, B.E., B.Sc., F.E.S.

The Hairs of Plants, by Mr. McKinnon, B.Sc.

Sponges, by Mr Hallmann, B.Sc.

Some Aspects of the Locust Plagues of South Africa, by Professor Watt, M.A.

To the above gentlemen our sincere thanks are due for their kindness in lecturing to the members.

Our special thanks are due to our President, Mr. E. Cheel, for his presence at our excursions as botanical leader, and to Mr. W. B. Gurney, F.E.S., as entomological leader. These gentlemen have frequently put aside personal engagements and their own pleasure that they might be helpful to the members, and the great success of our excursions is mainly due to their unselfish labours.

Our Quarterly Journal has been edited by Mr. T. Steel F.L.S., with great zeal and ability. We are greatly indebted to this gentleman for the interest he has taken in this work. Under his able guidance we hope to see the Society's organ a power in the scientific world of New South Wales in the future. The library is now practically catalogued, thanks to the labours of our Librarian and President, Mr. Cheel; and during the coming year should be a source of help to our members.

One of the great features of our meetings has been the rare and numerous exhibits which members have shown. There has been a most marked improvement in this direction during the year.

The Flora Society, in conjunction with our own, held an excursion at Brownsville, Illawarra, during the Easter holidays. This proved to be a great success, and was attended by about fifty members.

The amalgamation of our Club with the Flora Society has occupied the attention of your Council, and the fusion of the two Societies into the Naturalists' Society of New South Wales has been accomplished, and we shall start the New Year as a united body under the new title.

E. S. EDWARDS, *Hon. Secretary.*

BOTANY IN RELATION TO AGRICULTURE.

(Abstract of Presidential Address by Edwin Cheel, Botanical Assistant, National Herbarium, August 6th, 1912.)

The word "botany" is of Greek origin, and refers to any kind of herb, grass, or tree, no matter how small, or how large, or whether they are found wild on land, in fresh water, or in the ocean, or are cultivated by the horticulturist, orchardist, agriculturist, or forester; every form of plant is included in that great branch of Biology, known as the Science of Botany. In its broadest sense, it comprises many subordinate branches of the study, each with a distinctive terminology. A few special branches which may be mentioned are:—

Cytology, which is the science of the cell and its development; *Morphology*, which is a study of the external form of the plant; *Anatomy*, or *Histology*, which is a study of the tissues or structure of plants and of their organs, and the relation of such organs one to another; *Physiology*,

which deals with the life processes or normal functions, especially of the vital organs of plants; *Paleo-botany*, the study of fossil-plants; *Ecology*, the study of the mutual relationship between plants and their environment; *Taxonomy* or *Systematic Botany*, which is a study of the relationship of plants one to another for the purpose of creating a classification; *Phyto-geography*, the science of the distribution of plants; and *Pathology*, which is a study of plant diseases.

It is quite possible, and often desirable, for anyone to specialise in any of the above-mentioned sub-branches of the science, but, no matter which branch is taken up, it will be found that an all-round knowledge of the various branches or sub-branches of the study is necessary to be able to convey or communicate in an intelligent manner the results of one's work on the various vegetable products of the world.

A knowledge of "Systematic Botany" is of immense importance in agriculture and other branches of commerce, as we find in Systematic Botanical works that plants are grouped together according to their resemblances in structure, and through the aid of systematic botanical research, we are able to discuss, and disseminate general information concerning any special vegetable products of any particular region; works of this kind thus become a very valuable asset to this State or any other country.

In Agriculture the study of botany is becoming each year more important, as it is realised by many farmers that the central point in farming is in the plant itself.

"Get the most out of it," is the motto of the modern farmer. Climate should not be blamed altogether, as the plant itself is the most important subject to be dealt with, and not the soil, climate, season, or other factor of its environment.

Man very often takes a plant from its natural conditions and expects it to grow in an unnatural situation. Nature teaches us that, if one kind of plant will not grow in a given district, there are others that will; and we should endeavour to find out those plants that are most suitable for a given district.

Many eminent workers in Europe and America have realised that there is ample room for useful improvements in all classes of economic plants, and travel in various parts of the world in search of new plants of economic impor-

tance. There are others who, either consciously or unconsciously, seem to have a thorough grip of Charles Darwin's dictum, "That Nature causes benefits to arise from crossing, and abhors self-fertilization," and are endeavouring to bring together the most valuable plants of certain families, and are trying to centre the blood of the very best forms in given directions.

There are many wild plants in the Australian bush which may be profitably utilised, either as food, textile substances, or for other useful purposes.

In floriculture a great number of Australian plants have been grown in the conservatories and hot-houses of wealthy people in Great Britain and the Continent of Europe, and many of these have been considered of such merit that they have many years ago been figured in Curtis's Botanical Magazine and other European illustrated works not available to the Australian public.

There are many other wild flowers which have not yet been tried that are most attractive for their beauty and associations. An attempt should be made to develop forms or varieties from some of the best of our Australian vegetation, both by intense cultivation and by crossing with closely related forms.

In the United States of America, and also in South Africa, several species of our Eucalypts and Acacias have been considered of sufficient importance that in former years large quantities of seeds were purchased from firms in the Australian States for extensive cultivation for timber, tannins and other uses. Many of these are now sufficiently developed to be able to yield enough seed without importing them from our shores.

We do not seem to realise the importance of our native vegetation, and consequently the very best is now becoming scarce, and very little attempt is being made to replenish it by artificial aid.

Although many of the early explorers have pointed out some more or less useful Australian fruits, and to these have been added others by the works of the late Baron von Mueller, as well as by F. Manson Bailey, of Queensland, and by J. H. Maiden, R. T. Baker, H. G. Smith and others of our own State, very little attempt has been made to try and improve them by cultivation. Some of the very best which have already been brought under notice are: The Herbert River Cherry (*Antidesma Dallichyanum*), which

according to Bailey, grows into a good-sized tree and produces fruit equal to red currants. Several other species of this genus are also mentioned, including *A. parvifolium*, *A. Bunius*, *A. erostre*, and *A. Ghaesembilla*. Then we have the Logan Apple (*Acronychia acidula*), Native Grapes (*Vitis acetosa* and *V. antarctica*), Sebesten Plum (*Cordia myxa*), Native Cranberry (*Lisanthe sapida*), Ground Berries (*Astroloma pinifolia* and *A. humifusa*), Five Corners (*Styphelia spp.*), White-beard Berries (*Leucopogon Richei* and *L. lanceolatus*), Native Currants (*Leptomeria acida*), Native Elderberry (*Sambucus Gaudichaudiana*), Davidson's Plum (*Davidsonia pruriens*), Kumquat or Desert Lemon (*Atalantia glauca*), Finger Lime, (*Citrus Australasica*), Colane (*Owenia acidula*), Native Raspberries (*Rubus mollucanus*, *R. Moorei*, *R. rosaefolius*), Quandong (*Fusanus acuminatus*), Brush Cherry (*Eugenia myrtifolia*), Lily Pily (*Eugenia Smithii*), as well as a few others which do not appear to have local or popular names, such as *Nitraria Schoberi*, *Scaevola Plumeri*, *Garcinia Mestoni*, *Nephelium Lauterianum*.

Others which could be utilised are the various species of *Hibiscus* and other Malvaceous plants for hemp; *Dioscorea transversa* and *Parsonia Paddisoni* for yams; *Mucadamia ternifolia* and *Cryptocarya Palmerstoni* for nuts; as well as a few species including *Pygeum Turnerianum* and Native Grapes (*Vitis spp.*) which have been recommended as suitable stocks for grafting and budding plums and grape-vines respectively.

A large number of Australian grasses are well worth more attention than has been given to them in the past. for there is every reason to believe that among them there are many species quite equal in productiveness and feeding value to those introduced from other countries.

The various species of *Astrebula*, *Andropogon*, *Danthonia*, *Panicum*, *Eragrostis* and *Anthistiria*, have equal feeding value to any of those now cultivated, and may possibly be superior as regards their adaptability to certain of our soils and the climate, as well as for special uses.

There are also several kinds of legumes which as fodder plants may be better adapted to our climate than some of the introduced kinds, as Nature has provided some of them with thickened root-stocks, as is seen in some species of *Glycine*, so as to withstand lengthened periods of drought.

Without some knowledge of botany it is not a very easy matter to choose or distinguish the most suitable kinds of plants for cultivation from the ever-increasing number, which already stands at upwards of 194,000 species recorded in botanical literature, and when the numerous trade-names of the supposed varieties or forms, as recorded in the various catalogues of seed merchants, are also taken into consideration, it will be seen that the task of identifying a particular kind of weed or forage plant is a formidable one, especially when it is known that, for example, the 44 distinct "trade-names" used in connection with "Millet Grasses" are reducible to 13 species of six genera.

NOTE ON THE INDIAN WAX SCALE (*CEROPLASTES CERIFERUS*.)

(By Miss Gladys H. Froggatt.)

This coccid is plentiful at present on the branches of a persimmon tree in our garden at Croydon. Last autumn after the leaves had fallen, the tree was thoroughly cleaned by spraying; but this year it is as thickly covered as before. A fresh infestation evidently came from a spindlewood tree (*Euonymus*) on the far side of the garden, and once established on the suitable sap of the persimmon, thrive and rapidly increased.

As the adult female coccid is legless, and the tiny larva incapable of sustained effort, they were probably transferred to the persimmon tree on birds' feet or by some other outside aid.

This scale is a native of India, and was introduced here on plants many years ago. The secretion has been analysed, but it proved to be of no commercial value. Honey bees on several occasions have been noticed cutting and carrying away this waxy test, thus leaving the coccid exposed. What the bees finally do with this useless matter has not yet been ascertained. Also hungry little silver-eyes in winter have been observed pecking the coccid out of its protective shield—a newly-acquired habit.

The minute larvae, like those of many other scale insects, are hatched beneath the mass of wax which covers the female, and swarm out from beneath. They insert their thread-like sucking beak into the bark and suck up sap for their sustenance. They form fresh scales of waxy,

greasy matter, exuded from orifices on the abdominal segments. It is the increasing layers of exudation which form these large white masses now so much in evidence on the leafless trees.

The female coccid, so different from the original larva which possesses perfect eyes, antennae and legs, is now a dull-red, soft-bodied form, without any definite structure or appendages.

As with most coccids, the male is very rarely found, but is recorded as a microscopic two-winged insect, with slender antennae and large eyes, but without any mouth, and, therefore, his life is of the briefest.

KEY TO THE N. S. WALES GENERA AND SPECIES OF GOODENIACEAE.

(By E. Betche.)

It is now some 20 years since the publication of the Handbook of the Flora of N. S. Wales, and, during that period, experience in using the Key to the Goodeniaceae has shewn me the necessity for a revision which would take cognisance of the additions to our knowledge of the group which have since been made. In the light of that experience I now think that it was a mistake to substitute artificial sections for Bentham's excellent natural ones, and I have thought a new key would be interesting and perhaps useful to members of this Society.

Our first attempt to write a Flora of N. S. Wales was a very unambitious one. The late Mr. Moore got permission from the then Government for the publication in one volume, and instructed me, with the object of economising space, to extract uncritically shortened descriptions of the N. S. Wales plants from Bentham's *Flora Australiensis*, adding the species described subsequently to the publication of that work. The result was the handbook in its present form, though there is an immense difference between the work in its first and in its last conception.

In a dichotomous Key, the method followed is to find for each genus two contrasting characters which divide the constituent species into groups, and to continue to spilt each group again into two until the individual species is found. This, of course, necessitates a good knowledge of all the species, with their variations.

The Key now put before the Society is a modified

translation from Prof. H. Krause's *Monograph of the Goodeniaceae*, written for Prof. A. Engler's "Pflanzenreich," and published in 1912. I have transcribed the Key in the method rendered familiar to us by the *Handbook*, and have added two species—*Goodenia Stephensoni*, F. v. M., and *G. glomerata*, Maiden and Betche, omitted by Krause.

The genus *Brunonia* is separated by Krause from the Goodeniaceae and placed by itself in a small new family, the Brunoniaceae. In the genus *Goodenia* Krause abolishes Bentham's series Bracteolatae, and divides its species into two new series, the Rosulatae and Suffruticosae, an obvious improvement, but with the slight drawback that his new under-section Bracteolatae contains one or two species with sessile flowers, and, therefore, without bracteoles (*G. bellidifolia*). Two new species of *Goodenia* are described by Krause, *G. Boormanii* and *G. glabriflora*; the former is common in the Western plains and ranges of New South Wales, and is frequently confused with *G. geniculata* and *hederacea*, the latter a rare plant recorded only from Deniliquin.

Scaevola hispida is changed into *S. ramosissima* (Sm.), Krause. I always regret to have to drop an old, long-used name, but we have to follow the international rules of nomenclature, and these direct that the first specific name under which a species is described must be preserved if that species is transferred to another genus. The plant in question was described by Smith in 1793 as *Goodenia ramosissima*, and in 1801 as *Scaveola hispida*, Cav.

Dampiera Maideniana, Krause, seems to be hardly a good well-defined species, it comes very near to forms of *D. Brownii*, the localities given are, "West of Wellington Valley" and "near Murrumba."

1. Ovary more or less perfectly 2-celled,
with 2 to numerous ovules in
each cell.
2. Fruit dehiscent, opening in 2 or 4 valves
3. Anthers free (when the flower is
expanded).
4. Calyx free from the ovary, deeply
3-or 5-lobed or consisting of 3
or 5 sepals 1. *Velleia*.
- 4*. Calyx-tube adnate to the ovary,
the lobes free or adnate at the
base 2. *Goodenia*.

- 3*. Anthers coherent round the style.
Calyx-tube adnate to the ovary 3. *Leschenaultia*.
- 2*. Fruit indehiscent, more or less succulent. Anthers free. Calyx-tube adnate ... 4. *Selliera*.
- 1*. Ovary 1- or 2-celled, with 1 or 2 ovules in the whole ovary. Fruit indehiscent.
5. Anthers free. Corolla-lobes nearly equal, usually at length digitately spreading ... 5. *Scaevola*.
- 5*. Anthers coherent. Corolla-lobes the 2 upper ones deeply separated, erect and connivent ... 6. *Dampiera*.

1. *VELLEIA* Sm.

1. Calyx deeply 3-lobed.
2. Bracts large, broadly connate at the base ... 1. *V. perfoliata* R.Br.
- 2*. Bracts small, free, rarely slightly connate.
3. Erect herbs. Scapes or peduncles longer than the leaves.
4. Sepals broad, distinctly cordate at the base
5. Sepals ovate-cordate, nearly orbicular ... 2. *V. lyrata* R.Br.
- 5*. Sepals ovate-lanceolate, mucronate-acute, the margins slightly decurrent ... 3. *V. macrocalyx* De Vr.
- 4*. Sepals oblong-lanceolate, or the outer one almost ovate and slightly cordate ... 4. *V. spathulata* R. Br.
- 3*. Depressed herbs. Scapes shorter than the leaves ... 5. *V. montana* Hook. f.
- 1*. Calyx deeply 5-lobed or with 5 sepals.
6. Bracts large, broadly connate at the base... 6. *V. connata* F. v. M.
- 6*. Bracts small, free. Corolla mostly spurred ... 7. *V. paradoxa* R. Br.

2. *GOODENIA* Sm.Key to the Sections and Undersections
of New South Wales species
of *Goodenia*.

1. Ovules either imbricate in 1 or 2 rows in
each cell of the ovary or few
and erect from the base ... Section I.
Eugoodenia.
2. Pedicels with small bracteoles ... Under-section A.
Bracteolatae.
3. Flowers in long terminal leafless
spikes, racemes or panicles,
with small bracteoles on the
pedicels. Stems leafy or the
leaves crowded at the base or
rosulate ... Series i.
Racemosae.
- 3*. Flowers on axillary or radical
peduncles, the pedicels dis-
tinctly bracteolate.
4. Herbs with rosulate leaves, the
stem-leaves abbreviated except
the lower ones ... Series ii.
Rosulatae.
- 4*. Undershrubs or rarely herbs
with erect leafy stems ... Series iii.
Suffruticosae.
- 2*. Pedicels without bracteoles ... Under-section B.
Ubracteolatae.
5. Stems mostly erect and leafy,
the lower leaves not crowded.
Peduncles axillary, often artic-
ulate below the flowers ... Series iv.
Foliosae.
- 5*. Lower leaves rosulate, stem-
leaves few, small, or wanting.
Peduncles radical, rarely
axillary, often elongated ... Series v.
Pedicellosae.
- 1*. Ovules very numerous, closely packed
in more than 2 rows in each
cell of the ovary ... Section II.
Amphichila.

Section I. *Eugoodenia* Benth.Series 1. *Racemosae* Benth.

1. Stems leafy to the inflorescence. Leaves broad, sessile, decurrent ... 1. *G. decurrens* R. Br.
- 1*. Stems leafless or nearly so. Leaves mostly radical or rosulate.
2. Flowers sessile or nearly so, forming a terminal narrow spike.
3. Radical leaves obovate or obovate-spathulate ... 2. *G. bellidifolia* Sm.
- 3*. Radical leaves linear or linear-cuneate ... 3. *G. stelligera* R. Br.
- 2*. Flowers on long pedicels, forming a loose panicle or raceme ... 4. *G. dimorpha* Maiden & Betcher

Section 1. *Eugoodenia*.Series 2. *Rosulatae* Krause.

1. Calyx-lobes linear or oblong, obtuse.
2. Leaves densely pubescent or tomentose underneath, more sparingly so on the upperside, entire or slightly sinuate-toothed.
3. Radical leaves pubescent, linear-lanceolate or linear-obovate ... 5. *G. geniculata* R. Br.
- 3*. Radical leaves tomentose, lanceolate or spathulate-lanceolate ... 6. *G. primulacea* Schlecht.
- 2*. Leaves equally woolly on both sides, at least when young.
 4. Stems prostrate ... 7. *G. lanata* R. Br.
 - 4*. Stems erect, with the flowers in a dense cluster, almost concealed in the loose wool ... 8. *G. glomerata* Maiden & Betcher
- 1*. Calyx-lobes narrow-linear or subulate, acute.
 5. Bracteoles inserted about the middle of the pedicel.
 6. Leaves more or less hairy or tomentose.
 7. Leaves sessile with a broad base or shortly petiolate, equally hairy on both sides, deeply toothed ... 9. *G. heterophylla* Sm

- 7*. Leaves narrowed into a petiole, densely tomentose underneath.
8. Lower leaves broadly obovate or obovate orbicular, up to 5 cm. long ... 10. *G. hederaceu* Sm.
- 8*. Lower leaves oblong or lanceolate, up to 10 cm. long ... 11. *G. Boormanii* Krause.
- 6*. Leaves glabrous on both sides ... 12. *G. glabra* R. Br.
- 5*. Bracteoles inserted close to the calyx. Leaves slightly pubescent ... 13. *G. rotundifolia* R. Br.

Section 1. *Eugoodenia*.Series 3. *Suffruticosae* Krause.

1. Glabrous shrubs, undershrubs or perennials. Flowers yellow, glabrous outside.
2. Erect viscid shrubs or undershrubs.
3. Leaves from broadly-lanceolate to almost orbicular - cordate, denticulate, petiolate ... 14. *G. ovata* Sm.
- 3*. Leaves from narrow-lanceolate to almost linear, irregularly denticulate, almost sessile ... 15. *G. Stephensonii* F. v. M.
- 2*. Prostrate or ascending perennial or undershrub. Leaves narrowed into a petiole ... 16. *G. varia* R. Br.
- 1*. Glandular-pubescent perennial or undershrub. Flowers purplish or blue ... 17. *G. barbata* R. Br.

Section 1. *Eugoodenia*.Series 4. *Foliolosae* Benth.

1. Glandular pubescent herbs ... 18. *G. grandiflora* Sims.
- 1* Glabrous herbs ... 19. *G. calcarata* F. v. M.

Section 1. *Eugoodenia*.Series 5. *Pedicellosae* Benth.

1. Softly tomentose or villous herbs ... 20. *G. cycloptera*
R. Br.
- 1*. Glabrous herbs or sprinkled with
scattered appressed or silky
hairs.
2. Radical leaves pinnatisected.
3. Flowers large, 1.5 to 2.5 cm. long.
Seeds with narrow margins ... 21. *G. pinnatifida*
Schlecht.
- 3*. Flowers small, 5 to 8 mm. long.
Seeds with broad margins ... 22. *G. pusilliflora*
F. v. M.
- 2*. Radical leaves entire or irregularly
minutely toothed (rarely pin-
natifid in *G. heteromera*).
4. Radical leaves obovate or oblong-
spathulate ... 23. *G. elongata*
Labill
- 4*. Radical leaves linear to oblong-
lanceolate.
5. Corolla pubescent outside, ex-
cept the wings.
6. Corolla large, 1.5 to 1.8 cm.
long. Indusium glabrous ... 24. *G. glauca*
F. v. M.
- 6*. Corolla small, 8 to 10 mm.
long. Indusium sparing-
ly hairy ... 25. *G. heteromera*
F. v. M.
- 5*. Corolla glabrous outside... 26. *G. glabriflora*
Krause.

Section 2. *Amphichila* Dc.

1. Flowering stems much longer than the
radical leaves.
2. Radical and lower leaves from obovate
to lanceolate mostly toothed
and hairy on both sides... 27. *G. paniculata*
Sm.
- 2*. Radical leaves from linear to narrow-
lanceolate, mostly entire and
glabrous ... 28. *G. gracilis*
R. Br.
- 1*. Flowering stems shorter than or scarce-
ly exceeding the radical leaves 29. *G. humilis*
R. Br.

3. *LESCHENAULTIA* R. Br.

Single species 1. *L. divaricata*
F. v. M.

4. *SELLIERA* Cav.

Single species 1. *S. radicans*
Cav.

5. *SCAEVOLA* L.

1. Shrubs with rigid spinescent branches ... 1. *S. spinescens*
R. Br.

1*. Herbs or rarely undershrubs, not spinescent.

2. Flowers conspicuously pedunculate, in the axils of the leaves.

3. Corolla blue, 2.2 to 2.6 cm. long. Peduncles as long as the leaves or longer (*S. hispida* Cav.)** 2. *S. ramosissima*
(Sm.) Krause.

3*. Corolla whitish, 6 to 8 mm. long. Peduncles mostly shorter than the leaves... .. 3. *S. Hookeri*
F. v. M.

2*. Flowers sessile or nearly so in the axils of the floral leaves, all on the upper ones forming a terminal leafy spike.

4. Ovarium 2-celled.

5. Indusium glabrous except in cilia.

6. Stems erect. Leaves usually toothed 4. *S. ovalifolia*
R. Br.

6*. Stems prostrate. Leaves entire 5. *S. suaveolens*
R. Br.

5*. Indusium densely hairy on the back 6. *S. acmula*
R. Br.

4*. Ovarium 1-celled. Indusium hairy on the back 7. *S. microcarpa*
Cav.

** The name *S. hispida* Cav. dates from 1801, but as the same plant was named *S. ramosissima* Smith, in 1793, in accordance with the rules of nomenclature the former name gives place to the latter.

6. *DAMPIERA* R. Br.

1. Leaves more or less hairy, at least on the underside.
2. Calyx-lobes distinct, nearly as long as the ovary. Leaves flat, or nearly so.
3. Leaves shortly petiolate, coriaceous, lanceolate 1. *D. adpressa*
De. Vr.
- 3*. Leaves sessile, ovate to oblong-elliptical 2. *D. marifolia*
Benth
- 2*. Calyx-lobes inconspicuous or obsolete.
4. Leaves with revolute margins, linear to narrow-oblong ... 3. *D. rosmarini-folia*, Schlecht
- 4*. Leaves flat or the margins slightly recurved.
5. Old leaves scabrous above, more or less tomentose underneath.
6. Leaves lanceolate or oblong-lanceolate 4. *D. lanceolata*
A. Cunn
- 6*. Leaves ovate to nearly orbicular 5. *D. Brownii*
F. v. M.
- 5*. Old leaves glabrous above, ovate or ovate-oblong ... 6. *D. Maideniana*
Krause
- 1*. Leaves glabrous on both sides. Calyx-lobes conspicuous.
7. Hairs on the outside of the corolla ferrugineous.
8. Leaves narrow-oblong or linear, often dentate 7. *D. stricta* R.Br.
- 8*. Leaves oblong, mostly entire (*D. stricta* var. *oblongata*) 8. *D. oblongata*
R. Br.
- 7*. Hairs on the outside of the corolla silky-white 9. *D. Scottiana*
F. v. M.

NOTES AND COMMENTS.

EXCHANGES.—WATER BEETLES.—Mr. F. B. Brown, Claremont, Holywood, England, wants Australian water beetles, and would be glad to obtain specimens from any of our members. He will give in exchange British beetles. Mr. Froggatt will take charge of and transmit specimens.

ANTS, BEES, WASPS.—Specimens of any of these, their nests and anything illustrative of their economy, are wanted by Mrs. Maria Sadownikowa, Volhonka Antipievsky 10, Moscow, Russia. This lady is connected with the Moscow University for Women, and offers suitable exchanges. Full particulars may be ascertained from Mr. Froggatt.

NOTE ON THE FUNCTION OF THE VENTRAL FINS IN *Nomeus gronovii*.—This fish, which is known as the "Portuguese-Man-o'-War Fish," is well known as a small pelagic species, possessing a great geographical distribution. It occurs on the coast of New South Wales, most noticeably while the Siphonophore known as "Portuguese-Man-o'-War," or *Physalia*, is plentiful, swimming in the company of this animal. The fish is chiefly remarkable on account of its large ventral fins, which fold in a deep abdominal groove, as in the larger scombroid, *Gasterochisma melampus*, Richardson. In regard to these fins, Goode and Bean write*: "The large fan-shaped ventrals are used as support in resting on the bottom; and in swimming they are generally closed in their groove, unless the fish is moving leisurely, when they may be partly expanded." From this, one would, perhaps, gather that the first-mentioned use is the main function that these fins subserve, and Jordan and Evermann, in their great work on the "Fishes of North and Middle America," evidently intend this idea to be conveyed when they state,† on the authority of the previously-mentioned authors: "The large fan-shaped ventrals are used in support in resting on the bottom. In swimming, they are usually closed in their groove," particularly, as no mention is made of the latter portion of the statement of Goode and Bean. My purpose in writing this note is to state that it appears to me that the *sole* purpose of the development of these fins to such a large size, is to enable the fish to preserve its equilibrium, while slowly

* Oceanic Ichthyology (1895), p. 220.

† Bull. U.S. Nat. Mus., No. 47, part i. (1896), p. 949 (footnote).

moving along in the company of the *Physalia*. It has to be remembered that, apart from the action of currents, the siphonophore is dependent solely upon the winds; so that often, for long periods, its rate of motion, in any direction, must be exceedingly slow. Under the circumstances, then, it would appear to be very difficult for a fish having such a highly-compressed body as that of *Nomus gronovii*, to maintain its upright position in the water without some special provision—such as is actually to be found here—having been made. Of course, if the fish were travelling at any speed, the fins would be laid back in the ventral slit. Even though this species may use its ventral fins as supports, when in shallow water or aquaria, it must be pointed out that it is of such a pelagic nature that *the greater part of its existence is spent far away from shallow water and the bottom.*—David G. Stead.

LIPARID MOTHS.—At the June meeting Mr. C. H. Wickham showed a pair of *Darala chelepteryx*, a species closely allied to the common *Chelepteryx Collesi*. The larvae were found at Kensington feeding on *Bossiaea*, in October. After feeding on this plant for three months, on putting into the same cage another larva of a different species which was feeding on the Port Jackson Fig, the *Darala* took to the latter plant, on which they completed their metamorphosis. The larvae somewhat resemble those of *Chelepteryx*, but are smaller and not so hairy. They fed for four months, and remained three months in the pupal state.

THE GRAPE-VINE MOTH, *Phalaenoides (Agarista) glycine*.—Mr. Wickham reports finding the larvae of this insect feeding on *Hibbertia linearis*, R. Br., an occurrence not noted before.

WILD LIFE PRESERVATION SOCIETY.—This Society is doing valuable work in a quiet, unostentatious manner. At the Annual Meeting, presided over by His Excellency Lord Chelmsford, there was a large attendance. Mr. W. W. Froggatt, F.L.S., was elected president. Lord Chelmsford gave a thoughtful address, full of sympathy with the objects of the Society. Some of our unique native animals, he said, are within measurable distance of absolute extermination. The "opposum" is already becoming scarce, and the lyre bird is seldom seen in districts where formerly both were abundant. Closer settlement is driving back such characteristic creatures as the emu and kangaroo, while wild birds are becoming fewer and fewer. They could only regret that the Society was not in existence 50 years ago,

for much of the wanton destruction which has taken place in the past might have been prevented. Take the little native bear—one of our most beautiful and harmless animals—in all his travels he only remembered one case in which his host was able to point out to him specimens in their native habitat. It was now a rarity to see an old-man kangaroo in a wild state. The practice of laying poison for rabbits is largely responsible for the destruction of some of our most useful birds, and when our insectivorous birds are destroyed insect pests will increase without check, and it will be a hard matter to grow remunerative crops. Sir Joseph Carruthers proposes introducing a Bill into Parliament proposing the proclamation of all the waters of Sydney Harbour, Botany Bay, and Port Hacking as a sanctuary for aquatic birds, and it is much to be hoped that he will receive every support in this. Sir Joseph Carruthers also spoke, giving from his personal experience, particularly in the Goulburn district, an idea of how terribly the native fauna has suffered through meaningless slaughter.

By arrangement with Messrs. Pathe Freres, a wonderful series of moving pictures was thrown on the screen. These showed the opening of various blossoms, the movements of growing plants, birds feeding their young, and many others, and made a most instructive and entertaining display.—Ed.

PARASITIC WASP.—The species of Hymenoptera bred by me from the pupæ of *Miletus hecalius*, Miskin (Aust. Nat., Vol. II. p. 79), has been described (Proc. Linn. Soc. N.S. Wales, 1912, p. 199) by P. Cameron, as *Chalcis tegularis*, Cam.—G.A.W.

Queensland Heart Pea.—*Cardiospermum Halicacabum*, Linn. Exhibited at April meeting by Mr. Steel, is according to Bailey (Queensland Flora) eaten in the Moluccas as a vegetable. Taken with castor oil internally for lumbago on Malabar coast. The root is laxative, diuric and demulcent, and is used in rheumatic affections. I have noticed that the domestic fowl eats this plant freely, but will not so readily touch *C. hirsutum*, Wild.—T.S.

Diplodactylus vittatus, Gray.—This is one of the most innocent and harmless of lizards. A specimen was sent to me alive which had been brought into a Marrickville dairy by a cat, and, under the opprobrious title of "wood-adder," was looked upon with dread by the dairy people. It was sent to me with a caution as to how I handled it, and the information that the senders were greatly surprised that the cat did not die after touching it!—T.S.

BIRD NOTES.

THE WHITE-BACKED MAGPIE.—In New South Wales this bird (*Gymnorhina leuconota*) is typical of the southern tableland, and on the Manaro is very abundant; the Black-backed Magpie being seldom seen. It is a very beautiful bird, and it looks very fine when in flight, especially if viewed from above. Its call is rich and quaint, and in the early morning is an absolute "refresher." While travelling through Yarrangobilly recently I was very interested to observe one only of these White-backed Magpies among a large mob of the Black-backed form, which were spread about the place feeding industriously. From the locality noted, and towards the Manaro tableland, the bird becomes more abundant; while the Black-backed form correspondingly decreases.

QUAINT HABIT OF THE WHITE-NECKED HERON.—This species (*Notophoxyx pacifica*) has been observed by me in many places in the Western country of New South Wales, and several times I have had an opportunity of noting a very remarkable habit which it possesses. On one of these occasions I was using a small boat on the Barwon River (in the vicinity of Walgett), and at its junction with the Namoi River, in connection with my Fishery work. The boat was being rowed down the river, and a little distance away was one of the many giant Red-gums (*Eucalyptus rostrata*) which adorn the banks of the mighty, silent river. On a jutting bough was one of these White-necked Herons standing in an ordinary attitude. As I approached the bird slowly raised its bill and neck, and elevated its body until beak, neck, body and legs were almost in one vertical line. Simultaneously it dropped its wings loosely by its side until it looked exactly like a dead bird tied up by its beak and suspended—just as it would look if held in the hand under similar conditions. A knowledge of this habit enabled me on a number of occasions to discern this bird when otherwise it must have passed unnoticed—its general aspect at a little distance (under the conditions noted) being most unbirdlike. This species is sometimes called the White-necked Crane.

SPOTTED GROUND BIRD (*Cinclosoma punctatum*).—The bird to which, for want of a better designation, has been applied this most unsatisfactory vernacular name, is not often seen by the bush wanderer because of its extreme shyness. It will often run for quite a long distance (fre-

quently hiding) before it will take to its wings, and when it does fly, makes a pigeon-like or almost quail-like whirr. This, and a certain suggestion in its appearance, has given rise to a misleading name of "Spotted Ground-Dove" sometimes applied to the species. It is not related to the Doves in any way, being a member of the *Timeliidae* or Babblers. In size of body it comes between the Thrush and the common Indian Turtle Dove. When one gets close enough he finds it a very beautiful bird; and it is very prettily spotted and striped with white.

One afternoon, in the early part of this year, shortly after my arrival at Mount Victoria, en route to Jenolan, I took a short stroll along the main Western Road towards the valley, keeping as far as possible on the edge of the bush, so as to see as much as possible of the living things, I had the satisfaction of seeing a pair of these at close-quarters. One Flame-breasted Robin (*Petroica phoenicea*) was also seen. During April of this year, I again observed this bird in the ranges near Yarragobilly Caves.

GANG GANG COCKATOO (*Callocephalum galeatum*).—This quaint and beautiful little Cockatoo I have frequently seen on our Southern upland country and in various mountain parts, including the upper slopes of Mount Kosciusko; but I was very interested to see a fine example in a tree, on the banks of the River Hunter, at West Maitland, recently, while on a short visit there.

FRECKLED DUCK (*Stictonetta naevosa*).—During 1910, while I was visiting Narrandera, I picked out from among a number of Black Ducks, which had been shot on a lagoon on Buckinbong Station—a few miles out—a fine example of the Freckled Duck. It was looked upon as a great rarity by local people, who did not know what it was.—David G. Stead.

EXCURSIONS.

Kitty's Creek.—The warm hands of the afternoon sun folded back the mantle of grey mist which hung over the harbour and round the hills on Saturday, the 10th August, and as the soft light lit up the level surface of the Lane Cove River and made a tracery of shadows on the floor of the bush, one realised that Spring was already heralded. Sixty members of the Society attended the excursion to Kitty's Creek on that afternoon, a special launch conveying

the party from Fig Tree Wharf. The Rev. W. W. Watts was the leader, our object being to collect as many mosses as possible in the short spell at our disposal. Mr. W. W. Froggatt, Mr. W. B. Gurney, and Mr. E. Cheel were also with us to give any information on insects and general botany which might be desired. Mrs. Finckh kindly looked after the billy, and afternoon tea and refreshments made the social side of our excursion as successful as our scientific search. We secured a number of beautiful mosses, which are enumerated below. Already some of the bush flowers were flowering freely, the bushes of *Olearia ramulosus* being especially beautiful. The bunches of bush flowers on the launch as we returned made a marvellous show. The days are rather short yet for extended excursions, and those who were moss-hunters had to walk hard and make the afternoon strenuous to secure so many fine specimens; but the result was an ample reward for our labour. The attendance was the largest at any of our excursions yet held, there being over sixty present.

E. S. E.

RECENT PUBLICATIONS.

Linnean Society, N.S. Wales. Part IV. of the volume for 1911 contains several papers of considerable general interest. Mr. A. H. S. Lucas, M.A., records his analysis of the gases in the floats of vesicular sea-weeds. These are shown to consist of a mixture of oxygen and nitrogen, the former gas being present in considerably smaller proportion than in atmospheric air. The evidence seems to indicate that the gases are obtained by the plant from solution in the surrounding water, and are passed from cell to cell by the diffusing sap until finally liberated in the vesicles.

Analysis of the gas contained in the balloons of the Queensland vine—*Cardiospermum*, mentioned on another page, showed it to consist of ordinary air.

Another interesting paper, illustrated with plates, is that by Mr. D. McAlpine, on the fibro-vascular system of the apple.

In addition to the usual taxonomic index, a very useful general index is now provided with each annual volume. That for the present volume is most comprehensive, and adds greatly to the usefulness of the publication.

Australian Museum.—Two parts of the Records have been recently issued. One is devoted to descriptions of new and noteworthy shells in the Museum collection, by Mr. Hedley.

A feature of this paper is the beauty of the illustrated plates by Miss Winnifred West. These seem to us to be about as nearly perfect both in drawing and production as is possible, and are a credit to all concerned.

Part I. of Vol IX. contains several important papers. Mr. Dene B. Fry, in a very capable paper, describes a new genus and two new species of frog from North Queensland. Mr. Fry gives a most useful reference list of all Australian frogs described since the issue of Dr. Boulenger's catalogue in 1882, for which the thanks of students of this interesting group are due.

We are pleased to note a paper by H. W. Broleman, of Pau, describing the Museum collection of Australian Myriapoda. Most of the descriptions of this group have hitherto appeared in foreign publications, and we sincerely hope that the work so well begun in the present paper will be taken up and carried on by some of our younger naturalists on the spot.

Dr. Harvey Johnston contributes a carefully prepared paper on his re-examination of Krefft's types of Australian cestoda, thereby clearing away much that was obscure and doubtful, and leaving the path plain for future workers.

BALANCE SHEET. YEAR ENDING 31st JULY, 1912.
RECEIPTS.

To Balance	61 13 6
„ Subscriptions	40 10 0
„ Publications Sold	0 3 0
„ Advertisements in Journal	6 0 0
„ Interest, Savings Bank	0 17 6
	<hr/>
	£109 4 0

DISBURSEMENTS.

By Rent of Hall	7 15 0
„ Printing Journal	23 0 0
„ Typing and posting notices, Journal, &c.	11 5 0
„ Postages, Correspondence, &c.	2 3 4
„ Petty Cash	3 4 6
„ Balance in Savings Bank	61 16 2
	<hr/>
	£109 4 0

H. E. FINCKH,
Hon Treas.

Examined and found correct.

C. H. WICKHAM
A. S. le Souëf
Hon. Auditors.

THE
Australian Naturalist.

VOL. II.

JANUARY 7 1913.

PART 13.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

1st October, 1912, Royal Society's House, Mr. E. S. Edwards, M.A. (President) in the chair.

The following were duly elected members:—Misses J. Grainger, Delargy, Cotton, L. Carne, Ellen Poole, Masters R. Carne, Gapson, Proctor, Wilcox, Birks; Messrs. W. F. Blakely, H. Duckworth and J. Lynch.

Mr. T. Steel, F.L.S., read a paper entitled *Miscellaneous Entomologica*, and Mr. G. A. Waterhouse, B.Sc., F.E.S., one on *Myrmecophilous Lycaenid Larvae*. Both papers proved exceedingly interesting, and were followed by an instructive discussion. In addition to the specimens exhibited by the authors of the papers read, Mr. W. M. Carne showed some interesting botanical exhibits which are described under *Notes and Comments*. Mr. E. Cheel exhibited species of *Vicia* and *Lupinus*, and read a note on their economic value. Mr. Wickham, miscellaneous objects of interest, including the seed cones of *Sequoia gigantea*, the giant pine of California. These are only about the size of walnuts, which is a small cone for a tree attaining a height of 250ft.

5th November, 1912, Mr. E. S. Edwards, M.A. (president) in the chair. There were between 60 and 70 members present. The following were duly elected members of the Society:—Misses M. Stuart, A. Crowe, N. Macdougall, Mrs. Spencer, Messrs. Sulman, J. E. Carne, N. Courtney, and Rev. Mr. Cribb.

Mr. C. A. Sussmilch, F.G.S., gave a most lucid and capable lecture on 'The Origin of the Coast Line of New South Wales.' Mr. A. A. Hamilton read 'Observations on Two Rare Acacias at Leura, Blue Mountains,' illustrating his remarks with specimens. Mr. C. B. Fidler, B.A., contributed 'Notes on a Volcanic Eruption at Savaii, Samoa,' descriptive of a series of photos lent by Rev. Dr. George Brown.

The exhibits were of exceptional interest, and were as follows:—Miss Mabel Brewster, an ingenious vivarium for the observation of ants in captivity. Miss Mabel Brewster read a note on the subject, which is printed in this issue.

Mr. Maxwell, a beautifully-preserved collection of moths from Port Hacking. Mr. Horan, the teeth and jaws of a sheep, showing the so-called "gold" incrustation. A note on this subject appears in present issue.

3rd December, 1912, Mr. E. S. Edwards, M.A. (president) in the chair. The following specimens were exhibited: Mr. J. E. Carne, crude petroleum, coral-rock, and Tertiary fossils, Vailala River, Carnick River, and Purari, Papua. Mr. Wickham, a most interesting series of life stages of moths, some as yet unrecorded, illustrated by original water-color paintings. Mr. Gurney suggested that Mr. Wickham's notes should be submitted for publication in "*The Australian Naturalist*." Miss Brewster, *Psylla* (*Macropsylla fici*) a small sucking insect commonly attacking the leaves of Moreton Bay Fig, and causing the exudation of blotches of milky gum. Miss M. Brewster, two Hawk-moth cocoons, the larvae of which fed on Virginia creeper. Most Hawk-moths do not construct definite cocoons, those of the genus *Coequosa* being an occasional exception. Mr. A. G. Hamilton, a fasciated specimen of *Casuarina*. Mr. H. E. Finckh, Bladder-weed, *Utricularia*; an interesting orchid, *Dendrobium linguiforme*, and a useful aquarium snail, *Planorbis*. Mr. A. J. Carter, B.A., a series of rare Buprestid beetles of the genus *Stigmolera*.

MISCELLANEA ENTOMOLOGICA.

(By Thos. Steel, F.L.S.)

Feeding of Mosquito, *Culex alboannulatus*, Macq. In order to determine the quantity of blood taken by this mosquito, which is one of the commonest species occurring in dwelling houses about Sydney, an experiment was made by burning pyrethrum powder (Insectibane) in a bedroom in the morning. The mosquitos were quickly overcome, and could be readily collected about the windows to which they flew when they felt the effects of the vapour. A considerable number of gorged insects were placed in a glass tube, and a corresponding number which had not fed in another. These were weighed on a fine chemical balance. The unfed mosquitos weighed on an average 1.3 millegramme each, or at the rate of nearly 22,000 per ounce, while the gorged examples weighed 3.2 Mg., or about 9,000 per ounce. From these figures we see that at a meal a mosquito of this species is capable of ingesting 1.9 Mgs., or about $1\frac{1}{2}$ times its own weight of blood. A drop is a somewhat indefinite quantity, depending as it does on the shape of the orifice at which it is

produced and on the nature of the liquid, but the drop or minim of pharmacy is a definite volume, there being 17 minims in a cubic centimetre, or 480 per fluid ounce. At this rate, and taking the specific gravity of blood as 1.05, one minim would suffice to supply a meal to 32 mosquitoes, so that the volume of blood actually taken by an individual mosquito is seen to be but small.

Dr. S. T. Darling (Annals Trop. Med. and Parasit. Ser. T.M. IV., 179, 1910) in a paper dealing with the transmission of malaria in the Panama zone, incidentally refers to the quantity of blood taken by *Cellia albimana*, Wied., one of the malaria mosquitos of that region. The average weight of an unfed mosquito, was found to be 0.8 Mg., while that of those which had taken a moderate feed of blood was 1.6 Mg., so that the average quantity of blood ingested by this species was just equal to its own weight, and one minim of blood would suffice for a meal for 76 mosquitos. In some cases considerably more blood was taken by individual mosquitos, but the above figures are given by the author as representative.

Insect-trapping Flowers. The trapping of insects by plants is a sufficiently common occurrence and a large variety of devices exist by which insects are snared. Usually, as in the case of the Evening Sundew (*Drosera*), the pitcher plants and many others, the plant has an end to serve, and uses the trapped insects as food, or in the case of some plants to insure fertilisation. There are, however, some cases in which the trapping of insects is purely accidental, and, far from being of service, is actually detrimental to the plant. An interesting case which came under my notice some years ago illustrates this. On this occasion I captured in my garden at Petersham a specimen of the common She-oak Hawk-moth (*Macrosila casuarina*, Walk.) having attached to its proboscis, close to the tip, an angular-shaped object, which examination showed to be the connate stamen pyramid of an introduced Apocynaceous plant, which grows in an adjacent garden, and which was identified for me by Mr. J. J. Fletcher as *Mandevilla sauveolens*, Lindl. The moth had evidently been visiting the plant for nectar, and having inserted its proboscis, the tip of the latter got jammed in one of the tapering slits on the stamen pyramid. Being unable to withdraw the proboscis, the moth, in its struggles for freedom, tore away the entire pyramid, which remained firmly fixed to the proboscis. The specimen as found is exhibited. In order to ascertain the force exerted by the moth in pulling off the stamen pyramid, I tried the experiment on a number of blossoms of attaching a little pan by means of fine thread

and adding weights until the pyramid gave way. The weight required was somewhat variable with different individual blossoms, ranging from 25 to 60 grammes, the average of seven trials being 40 grammes, or about 1 1/3 oz.

Mr. Fletcher has placed on record (Proc. Linn. Soc., N.S. Wales IX., 1894, p. 363) the trapping of hawk-moths by this plant.

Other exotic plants having similar floral structures, and which when introduced to this country prove fatal to indigenous insects, are *Rhynchospermum jasminoides*, Lindl., an Apocynaceous plant from China, and *Arujia sericifera*, Brot. (Syn. *A. albeus*, G. Don. and *Physianthus albeus*, Mart.) belonging to the Asclepiadeae, a native of South America.

The trapping of an indigenous flower-frequenting Tabanid fly by *R. jasminoides*, which is not uncommon in gardens about Sydney, is recorded by Mr. Fletcher (Proc. Linn. Soc. N.S. Wales, VIII., 1893, p. 45). Some years ago Mr. A. G. Hamilton gave me specimens of the flowers of *A. sericifera* grown at Mount Kembla, which had trapped various butterflies and other insects. Specimens are exhibited which had in this way caught the following butterflies:—*Junonia villida*, *Pardalona flavovittata*, *Zizera labradus*, *Hesperilla compacta*, and a small moth. There was also a common bee, *Apis mellifera*. The butterflies were identified for me by Mr. Waterhouse.

In their native habitats these plants do not appear to act as insect traps, the reason being that associated insects have learnt the nature of the flowers and know how to rifle them without being caught, while the insects of Australia have not acquired this knowledge. The mechanism of the stamen pyramids or bundles, is doubtless designed to prevent the access of insects which are unable to effect fertilization, while offering no obstacle to suitable visitors. Obviously trapping insects would be unfavourable to the plant, as it would by blocking the flower, effectually prevent the visit of other desirable insects.

“Bull-dog” Ant. *Camponotus forcipes*, Forel.

Some time ago I brought under the notice of the Society (Aust. Nat. ii, 1911, p. 67) a specimen of this ant which through some unknown cause had lost its abdomen and one leg, and yet was on active duty guarding the entrance to the nest. On another occasion at Leura I noticed an individual of the same species which had also lost the abdomen, which had been amputated just behind the first abdominal node. The insect was otherwise intact, and when found was running with numerous others on the surface of a nest. Microscopic examination indicates that the abdomen had been for-

cibly removed, perhaps in fighting. Many insects appear to be but little inconvenienced by serious mutilations such as these. Thus a wasp may have its abdomen snipped off while feeding, and yet will continue to suck honey until a large drop collects behind where the abdomen was.

Recently one of my sons found a metallic blow-fly *Lucilia caesar*, Linn., which had lost its abdomen, crawling, apparently quite unconcerned, on a window.

On another nest of *U. forcipes* I observed an ant dragging a small stone along by aid of its jaws. The stone appeared to me to be a heavy load, so I secured ant and stone, and taking them home weighed them on a chemical balance. The ant weighed 0.06 and the stone 0.57 gram., so the load was almost ten times that of the ant. This is equivalent to a man dragging along the carcase of a large bullock.

Last summer when at Leura I saw an ant of the same species dragging a eucalyptus leaf which it had seized by the stalk. The ant weighed 0.057 and the leaf 0.59 gram., so here again the load was just about ten times the weight of the ant.

PRELIMINARY NOTES ON MYRMECOPHILOUS LYCAENID LARVAE.

(By G. A. Waterhouse, B.Sc., F.E.S.)

It has been known for many years that the larvae of the Australian "Blues" are in many cases attended by ants or even pass a portion of their life in ants' nests. The ants obtain from the larvae a much prized secretion that exudes from certain dorsal glands. Unless this secretion is removed the larvae will die, so to successfully rear them a supply of the correct species of ant is necessary.

Many interesting interrelations between the ants and their guests remain to be discovered. Does the female lay her eggs on a tree that has an ants' nest at its base, or do the ants collect the eggs and young larvae? In only a few cases have the names of the ants attending particular larvae been recorded.

Ogyris genoveva is attended at Como and Killara by *Camponotus testaceipes*. This ant is a moderately large one, with a black head and abdomen, and a yellow thorax, and closely resembles the sugar ant, *C. nigriceps*, that so often invades our pantries. The food plant of the butterfly is *Loranthus*, and when a *Camponotus* nest is at the base of the host tree the larvae may be found there. Usually the larvae are found singly under pieces of bark attended by four or five ants. In this case the young larvae are secured by wander-

ing ants. It would be an interesting observation to find out at what time the larvae feed, and whether the ants guide them to and from their food, as I have observed with other species. This *Ogyris* has been found at Como attended by *Camponotus intrepidus*, and on the Richmond River I have noticed a third species of attendant ant. *Miletus ignita* is associated with *Iridomyrmex nitidus*. The eggs are laid at the base of wattle trees (*A. pycnantha* and *A. decurrens*). The ants find the young larvae and attend them, whilst they hide near the base of the wattle in the day time. The larvae are usually partially covered in by the ants, and may even be found in the ants' tunnels or nests. I have not yet been able to determine where the larvae pupate. A tree at Killara that was known to have larvae at its base was carefully uprooted and examined, and all the ants' tracks searched. Though eight pupae were noticed, these were all parasitised, no empty pupal skins could be detected, but there were many freshly-laid eggs.

The larvae of the following Australian Lycaenidae are generally, if not always, attended by ants, though in many cases the ants have not yet been determined:—*Miletus delicia*; *M. ignita*; *Pseudodipsas brisbanensis*; *Lycaenesthes affinis*; *Theclinesesthes miskini*; *Ogyris abrota*; *O. ianthis*; *O. oroctes*; *O. hewitsoni*; *O. amaryllis*; *O. genoveva*; *Arhopala amytis*; *A. eupolis*; *Ialmenus evagoras*; *I. eichhorni*; *I. ictinus*; *I. daemeli*; *I. inous*; *Pseudalmenus myrsilus*.

Liphyra brassolis lives in the nests of the green ant, but feeds on their young, and is treated as an enemy. The larvae of the following species sometimes have ants running over them, but are not dependent on these for their existence:—*Candalides heathi*; *Polyommatus boeticus*; *Catochrysops platissa*; *Zizera labradus*. The following two larvae are well known, but have never been found attended by ants:—*O. olane*, *M. hecalius*. Ants have not so far been noticed attending any of the other known larvae.

OBSERVATIONS ON ANTS.

(By Mabel N. Brewster.)

The following observations were made on ants kept in captivity:—The formicarium used consisted of a wooden board furnished with four legs, standing in a shallow vessel of water. At each corner of the board, which was covered with a layer of earth, was a piece of cork, one-third inch in thickness, and on these was supported a sheet of glass which served as a cover. The ants under observation were placed on the soil.

Ant used, *Polyrhachis ammon*. Specimens found at Terrigal, October 6th, 1912, consisting of three adults, a number of larvae, and two pupae, but the latter soon died. On October 8th one of the adults got drowned, and I then placed in the nest a few more ants, winged, wingless, and pupae. The adults had all disappeared, save one, by 11th October, and on 12th October I removed the larvae from the nest and fed them on condensed milk and Benger's food. On October 13th two of them pupated, and on the 17th two more. On October 19th I collected ten winged, two workers, and ten pupae of the same species at Mosman. For the first day the ants kept still, but on the second day the workers were moving about, while the winged ants remained stationary standing over the pupae. When the glass was lifted the workers became very active and showed fight; they fed the winged ants, giving a jerk of the head as if to notify the latter. When a winged ant wandered, it was promptly carried back and put well amongst the others. The workers appeared to divide the winged ants and would only feed their own lot.

On Oct. 22nd a winged ant died, and between this and the 25th two workers and one winged hatched out. I noticed a winged ant take hold of a pupa and tear it open. Though I tried to drive it off, it remained firm. It was then joined by another, which appeared to talk to it, and started ripping open the case. One of the ants then left while the other remained holding the case. In fifty minutes from the commencement of opening the case the head of the emerging ant appeared. The attendant ant appeared, to be washing the face of the young one. It then further ripped open the case; got another winged ant to hold the case while it completed the opening. As each limb appeared the attendant ant appeared to wash it. The young one did not give any assistance. When at last it emerged its wings looked like two pieces of jelly. It kept moving its jaws and limbs up and down. The one winged ant washed its body while the other attended to the wings. After about 20 minutes, one ant went away while the other remained working at the wings, separating and cleaning them. The other ant then returned, and the two worked hard, one holding while the other pulled the wings clear of their sticky covering. Then two more ants came, each taking a wing. The final cleaning was finished in a total time of 4 hours.

OBSERVATIONS ON THE OCCURRENCE OF TWO
RARE ACACIAS AT LEURA, BLUE MOUNTAINS.

(By A. A. Hamilton.)

For East is East and West is West,
And never the twain shall meet."

—Kipling.

The writer was reminded of the above couplet while studying the habitat in Leura of two Acacias *A. Dorothea*, Maiden, and *A. obtusata*, Sieb. var. *Hamilton*, Maiden. Allowing a margin of one or two hundred yards for overlapping, the boundaries of the two species in this area are:—Blackheath St. on the East, Leura Mall on the West, Bathurst Rd. on the North, and Megalong St. on the South. The two species face each other, East (*A. obtusata*, var.) and West (*A. Dorothea*), about half way between Blackheath St. and Leura Mall, an almost straight line from the Bathurst Rd. South to Megalong St. dividing them, neither crossing into its neighbour's territory. On either side of the residence known as "Gibba Gunyah," on the Bathurst Rd., are vacant allotments, which are both thickly grown with one of these "Wattles," just now (Sept.) in bloom. *A. obtusata*, var. has usurped the eastern allotment, no plant of *A. Dorothea* being present, while the western vacancy is occupied by *A. Dorothea*, its neighbour *A. obtusata*, var. being rigorously excluded.

On the western slope of Leura Mall, in the hollow south of the Leura Railway Station, the prevailing "Wattle" is *A. rubida*, Cunn. (with its typical discoloured phyllodes and bipinnate leaves on the same branch), which Mr. Maiden gives as an affinity of *A. Dorothea*.

The examples of *A. Dorothea* collected at Leura give the impression that the inflorescence is in a state of transition, some of the specimens having the flowers in almost globular heads while in others the flower heads are gradually elongated into a short spike.

Acacia Dorothea (Maiden) was described and figured in the the Proc. Linn. Sey., N.S. Wales, Vol. 26, 12, Plate I. Later in the same publication, V. 34, 358, principally on the evidence of specimens in bud from Leura, it was removed from the section *Uninerves*, and placed in the section *Juliflorae*. Several plants of *A. Dorothea* are growing in the grounds of St. Alban's Church of England. These I recommended to the care of the pastor, Rev. Walter Ellis, who displayed considerable interest in them when informed of their rarity and the prospect of their early extinction in this neighbourhood. In order to minimise this calamity I have grown

(from both root-suckers, and seeds) *A. obtusata*, var, in my garden at Leura; and hope to secure examples of *A. Dorothea* this season.

Acacia obtusata, Sieb. var. *Hamiltoni* Maiden will be found described and figured in Mr. Maiden's work, The Forest Flora of N.S.W., V. 153, plate 131.

As most of our members are familiar with the topography of Leura, no difficulty should be experienced by those interested in following the boundaries of these *Acacias* as they occur in this locality.

Both have been found west of Leura, *A. Dorothea* as far as Clarence Siding, and *A. obtusata*, var, at Mt. Wilson (in young bud), by Mr. Maiden in 1896, and recently it was discovered at Bell, in close proximity to the species of which it is a variety, *A. obtusata*, Sieb. The latter plant, though well established on the southern tableland, is rare on the Blue Mountains. (Forest Fl., V. 130.)

NOTE ON EXHIBIT OF PLATES OF VOLCANIC ERUPTION AT SAVAIL, SAMOA, OCT. 1905.

(By C. B. Fidler, B.A.)

The photos. exhibited were kindly lent by Rev. Dr. Brown. The lava flood covered from 20 to 25 square miles of country to a depth, in some places, of between 300 and 400 feet. Two photos show a portion of the lagoon which in a fortnight was converted into an iron-bound coast. An interesting picture shows the four walls of a dwelling surrounded by the lava to their full height. The lava surrounded, but did not destroy, the house. The explanation suggested is that the gases evolved from the lava formed a protecting cushion between the latter and the walls. A similar case is given by Kingsley in "Madam How and Lady Why," and he explains the phenomena in this manner. That large volumes of gas are given off by the lava is demonstrated by the fact that in the crater at Savail bubbles rose large enough to send waves to the sides.

In the discussion which followed the reading of this note Mr. Sussmilch said that so far as he could see from the photos the lava descended slowly, cooling rapidly on the outside as it progressed. Any moderate-sized object would readily turn aside a sluggish stream of this kind. Slag running from a blast furnace can be diverted by a pebble placed in its path. (The occlusion of gases in lava and in the rocks produced by its solidification, as well as other rocks, is well known. By heating fragments of rock in an exhausted flask, the gases

may be extracted and afterwards measured and analysed. Examination has shown that ordinary volcanic and metamorphic rocks contain gas under considerable pressure, sufficient when liberated and measured at atmospheric pressure to occupy several times the volume of the containing rock. In samples of schist, granite, gneiss, basalt, etc., examined by Prof. Tilden, the gases were found to range from 1.3 to 17.8 times the volume of the rock, and consisted mainly of hydrogen and carbonic acid. See Proc. Linn. Soc. N.S. Wales, 32, p. 33, 1907.—Ed.)

BOTANICAL NOTES.

(By E. Breakwell.)

Drought-resisting Grasses.—The two grasses shown appear to be the commonest nutritious drought-resisting grasses in Nyngan district. They are *Panicum gracile*, R. Br. and *Neurachne Mitchelliana*, Nees. Nyngan has had no rain for ten weeks, and the ground appears to be for a depth of nine inches devoid of moisture; yet the grasses (*P. gracile*, by its numerous long rootlets and *N. Mitchelliana* by its bulbous, woolly roots) derive and conserve moisture sufficient for their maintenance.

Poisonous Plants.—One poisonous and two reputed poisonous plants may be seen growing in close association in the "monkey" country in Coonamble district, *Nicotiana suaveolens*, Lehm. (Wild Tobacco), *Swainsona orcinotropis*, F.v.M. *S. luteola*, F.v.M. The manager of Coonamble Government Farm informs me that only quite recently two cases of poisoning have been reported in his district from the tobacco plant.

Blennodia lasiocarpa, F.v.M., and another weed, *Sisymbrium orientalis*, are very common on waste and cultivated lands at Nyngan Government Farm. On the areas to which sheep have access both plants are eaten down.

"Hairy Heads" (*Trichinium erubescens*, Miq.). Mr. Fred. Turner, in his "Fodder Plants of Australia," states that this plant may easily be detected among the surrounding vegetation by its lively green foliage. This is true, but it is no less conspicuous at present among the barren Wilga-Buddha scrub at Nyngan and Coonamble, by its striking inflorescence, which imparts a decided relief to the bare monotony of its environment.

Helipterum floribundum, D.C. This weed comprises from 80 to 90 per cent. of the flora on railway areas, and adjoining lands at frequent intervals from Dubbo to Nyngan, a distance of 100 miles. Trustworthy graziers in-

formed me that the weed is more abundant this year than they have ever known it, owing, probably, to the bountiful late winter rains. In flower it presents a remarkable appearance, resembling a vast field of snow. The manager of Nyn-gan Government Farm states that stock will not eat it unless forced by hunger, but that they rapidly fatten on it. The statement is made that a grazier travelling with starving stock, leased a paddock of this weed, and that in six weeks these became prime cattle. —Nov. 5, 1912.

EXCURSIONS.

Como, Sept. 7th.—The excursion was very well attended and produced some very good results. Before the main party arrived, Master Oliver Edwards was fortunate in finding a web of *Delias harpalyce* Don. on *Loranthus* growing on *Casuarina*. The web had fixed to it 32 freshly turned pupae, and one was subsequently found on a twig beneath the tree. The pupae emerged during the first week of October and produced 15 males and 17 females. A pupa of *Delias nigra* Fabr. was also found and the butterfly emerged on 30th September. Search was made for larva of *Ogyris* in ants' nests; unfortunately only one was found, attended by *Camponotus intrepidus*. Further details of larvae in ants' nests will be found elsewhere in this issue.—G.A.W.

RECENT PUBLICATIONS.

FRUIT-FLIES, AND NATIVE FRUITS.—There has recently been issued as Farmer's Bulletin, No. 55, by the Department of Agriculture of New South Wales, a highly interesting and important paper by Mr. W. B. Gurney, on the above subject. The question of the native fruits which act as hosts for fruit pests of various kinds is here carefully worked out, and the result is a valuable contribution to a matter of vital importance to orchardists. We strongly urge all interested parties to procure a copy of Mr. Gurney's paper, which may be had free on application to the Department.

NOTES AND COMMENTS.

SEEDS OF *ZANONIA MACROCARPA*.—At the October meeting Mr. W. M. Carne exhibited specimens of this and the following interesting seeds. A beautiful winged seed, upwards of four inches across the wings. When dropped from a height the seed travels a considerable distance, with a fine gliding

motion. It is produced in a round gourd-like fruit, by a cucurbitaceous climber in the jungles of New Guinea, where the power of gliding is doubtless of advantage in the dispersal of the seed.

SEEDS OF ERODIUM CYGNORUM.—This well-known member of the Geraniaceae, is commonly called Crowfoot by country people. It is an excellent fodder-plant in winter and spring. The seeds, however, constitute its objectionable feature. They resemble the fruits of the spear grasses (*Stipa spp.*), though less harmful. In both cases the seed is pointed, with hairs pointing back to prevent its withdrawal from the soil. The seed is furnished with a long twisted awn, which curls and uncurls with changes of moisture. This movement aids the penetration of the seed. In both cases, not only is wool deteriorated, but sheep are irritated and injured. Spear grass seeds have been known to penetrate into the bodies of sheep, and even into their bones, having worked in from the skin.

MONTHS CAPTURED IN BED-ROOM. At the April meeting Mr. Wickham exhibited a collection of moths captured in his bed-room at Mosman in the course of one season. The following is the list of names, in-so-far as they could be identified:—*Macrosila casuarina*, male and female; *Sericea spectans*; *Antheraea eucalypti*; *Epidesmia* Sp.; *Euplexia nigerrima*; *Leucania unipunctata*; *Teara constrictis*; *T. pustulata*; *Ophideres dejungens*; *Spilosoma obliqua*; *Pinaro* Sp.; *Selidosima encursaria*; *Crysiphona occultaria*; *Eurolothia bipunctifera*; *Adenestis Australasiae*; *Comodes elegans*; *Heliocausta hemiteles*; *Melanodes anthracinata*; *Agrotis munda*; *A. infusa*; *Plusia verticillata*; *Tophodes sinistraria*; *Teia anartoides*; *Daralaca acuta*; *Porthesia obsoleta*; *Perrisectis australasiae*.

HETERONYMPHA MEROPE. At the October meeting, Mr. Wickham reported having observed this butterfly attaching its eggs singly to blades of grass on Gooseberry Island. It was previously thought the eggs, in common with those of other grass-feeders, were dropped during flight.

Bidens pilosus, Linn. Collected at Mosman, Sydney, 4.v.12. In the "Flora Austral," 3. 453, the flowers of this plant are described as having the ray florets white, short, or sometimes wanting. The "Hand Book of the Flora, N.S. Wales," p. 202, says:—"Ray florets," "white (wanting in most Port Jackson specimens)." The writer has collected specimens of this plant in many places in the neighbourhood of Port Jackson, but has not, prior to this occasion, succeeded in finding specimens with ray florets. The sup-

pression of the ray florets in this plant, especially in examples growing in the Port Jackson district, affords yet another interesting problem for the student.

Cryptostylus leptochila, F.v.M. Wentworth Falls, Dec., 1902, Bell, Jan., 1912. A somewhat rare orchid previously recorded from Mittagong, Springwood, and Kurrajong. A mountain species, with a limited range north and south. A fairly wide valley separates Mittagong and Wentworth Falls. This geographical data may be of interest to those interested in the laws governing plant distribution.

—A. A. HAMILTON.

Mr. E. Cheel exhibited herbarium specimens, together with a number of fallen flowers of *Callistemon viminalis* Cheel, showing the filaments united at the base into a distinct ring or tube. A piece of timber measuring 10 inches diameter, was also exhibited, taken from a tree removed in May last from the border in Garden Palace Grounds, along Macquarie-street, which has now been done away with, for the purpose of widening the street.

Specimens of this species were originally collected by Banks and Solander, when accompanying Captain Cook to these shores in 1770, and it was named by Solander in his M.S. as *Metrosideros viminalis*. Solander's name was published by Gaertner in his *De Fructibus et seminibus Plantarum*, vol. i., p. 171, and a figure of the fruits is given in the same work on table xxxiv., fig. 4. It is also mentioned by Sir James E. Smith in *Transactions of the Linnean Society*, vol. iii., p. 272 (1797), who says:—"At first I had a suspicion that the *Metrosideros viminalis* of Gaertner was the same as his *M. salignus*, but having examined the original specimens in Sir Joseph Bank's collection, was convinced that they were very different, having linear-lanceolate leaves, not tapering at the ends, and with downy flowers.

The name *Metrosideros viminalis* seems to have been overlooked by both Bentham and Mueller, as it is not mentioned in the *Flora Australiensis*, or in any of Mueller's works.

The habit of this species is so distinct in the field that there should be no difficulty in distinguishing it from other crimson flowering species, as it grows into a fine tree, from 20 to 60 feet, or more, in height, and the trunk is usually fairly large, and produces some very useful timber, even larger than that of *C. salignus*.

The leaves somewhat resemble those of *C. lanceolatus*, but are thinner in texture, and the oil glands are different, when closely examined.

It is interesting to note that the peculiar way in which

the filaments cohere at the base into a distinct tube, was also noticed by Bentham, who included specimens collected on the Pine River, Queensland, by Fitzalan, "with the filaments united at the base," under *C. lanceolatus*.

These specimens are in the collection at the National Herbarium, Melbourne, and should be now named *C. viminalis*.

A key to the species of the genus *Callistemon* is published in part 3 of Mr. Maiden's "Illustrations of the New South Wales Plants."

An interesting specimen was also exhibited by Mr. Cheel, of the Solomon Island ivory nut (*Coelococcus solomonensis*), with the embryo taken out of the outer shell, and showing the rootlets fairly well advanced.

VETCHES AND LUPINS.—Mr. E. Cheel exhibited some interesting specimens of "Wild Vetches," including *Vicia villosa*, commonly known as "Hairy Vetch," a native of Western Asia. *Vicia tetrasperma*, sometimes called "Lentil Vetch," also a native of Western Asia, North Africa, and Europe, and *Vicia sativa* var. *angustifolia*, a narrow-leaved form of the cultivated "Spring vetch," or "Tare."

These three vetches, it was explained, were growing very luxuriously in the neighbourhood of Tempe all through the cold winter months of July, August, and September, and were now (October) forming their pods very freely.

Farmers and pastoralists often complain of the scanty supply of herbage during the cold winter months, yet these plants thrive without any preparation of the soil, and would supply a large amount of herbage for feeding stock. If the seeds were gathered and cared for, in a few years the vetches might be just as useful as the "Kidney Vetch" (*Anthyllis vulneraria*), proved to be in Europe. This species is a legume found wild in Europe, and was first introduced into cultivation by a German peasant about fifty years ago. It appears that this plant was seen to grow on the calcaraceous soils of dry hill-sides in places too poor to support wild clovers. The peasant gathered a few seeds, sowed them the next year, and kept on sowing them and saving the seed until he had enough to plant quite a large field. From this small beginning the cultivation of the "Kidney Vetch" has spread through Northern Germany and many other countries.

Some specimens of *Lupinus hirsutus* were also exhibited, which have become naturalised at Tempe, and grow luxuriantly through the winter months.

This species, it was explained, had been a great boon to

farmers in Europe, who sowed the seeds on very poor, sandy soil, and ploughed them in as a green manure.

It has become naturalised on sandhills at Grange Road, South Australia, and Mr. A. A. Hamilton also quite recently found a large patch at Woy Woy. A specimen of "Spider Orchid" (*Caladenia filamentosa*) was exhibited, collected by Mr. Waterhouse at the Como excursion in September. This species is common in West Australia, and is recorded by Benthams from Mudgee, and by Moore and Bêche from Warrah to Boorowa. The only other Port Jackson record is from Manly, in the proceedings of the Linnean Society of New South Wales, vol. xxvi. (1901), p. 213.

"Gold-coated" Sheep's Teeth.—The incrustation on sheep's teeth, exhibited by Mr. Horan, is not gold, but consists of ordinary "tartar," a deposit derived from the animal's food. The yellow metallic lustre is due to the "tartar" being deposited in thin translucent lamellae, the edges of which reflect the light in such a manner as to give the metallic appearance. (See a paper by Professor Liversidge, in Proc. Royal Society, New South Wales, vol. xxxix., 1905.—Editor.)

Notes on *Tristania conferta*.—The Brush Box is perhaps the most popular of our native trees for planting, especially for street avenues. Irregularity of flower structure is usually associated with some adaptation to secure fertilisation. The development of a lip is especially a frequent character of entomophilous flowers. The Brush Box provides an illustration of a regular flower tending towards the production of a lip-like irregularity, from quite another cause. The flowers are produced in clusters of seven on lateral peduncles from the young shoot from the terminal buds of the branches. Each group consists of a terminal flower continuous with the peduncle, and two lateral groups of three, with the same cymose arrangement. The central flower matures first. The petals are imbricate, and the outermost encloses the rest, and is greenish on the back. The remaining four are pure white. In opening, the outermost petal, which is cup-shaped, opens freely, and stands parallel to the axis of the branch. The other petals remain at right angles to the branch, prevented from opening further by the lateral groups of younger flowers. Thus, in a purely mechanical way, an irregularity is imparted to what would otherwise be a decidedly regular flower.

The lateral groups of these flowers are so placed that a line passing through them, passes also through the branch on which they are borne.

W. M. CARNE.

THE RESISTANCE OF DIPTEROUS LARVAE TO POISONOUS LIQUIDS.—The remarkable power of resistance to injury of many fly maggots when placed in liquids which quickly prove fatal

to other larvae has been frequently noticed by naturalists. Thus Gurney found when investigating the habits of fruit fly maggots, that these were capable of surviving and completing their metamorphosis after immersion in sea water, methylated spirits, or even kerosene. P. Schulze (Zool. Anseig, 1912) describes his finding maggots of a small fly (*Drosophila rubrostriata*) swimming in the formaline in some tins of preserved specimens from Africa, and that these were not inconvenienced by the addition of more strong formaline solution.

One of the difficulties in destroying sheep fly maggots is the power which they possess after being drenched with oil, carbolic, or other mixtures, or crawling into soft soil in which they can clean themselves and pupate without having suffered any permanent injury.

The occurrence of larvae of flies of the genera *Ephydra* and *Halmopta* in the brine of salt pits in Europe, and of others in similar unpromising situations, is well known. Perhaps the most remarkable case on record is that of the Petroleum Fly (*Psilopa petrolei*), described in Pomono College Jour., of Entom. Vol. iv., p. 687, May, 1912, by D. L. Crawford. The larva of this fly lives, feeds, and swims in the pools of crude petroleum oil at the various oil fields of California. Careful investigation shows that the larvae apparently derive their nourishment from the oil and not from insects or other organisms which have got mixed therewith. The adult flies hover about the oil pools, while the young from the moment of hatching until they crawl out to assume the pupal stage, live entirely swimming in the oil. Immersion in the oil is immediately fatal to the flies themselves. Full details, with illustrations, are given of the curious mechanism by which breathing is effected without permitting the oil to enter the spiracles.

W.W.F.

AUSTRALIAN FAUNA AND FLORA.

All lovers of Nature will read the following extract with pleasure.—Ed.

The gradual disappearance of birds and trees indigenous to the Richmond River has been exciting the attention of local naturalists for some time. In order to prevent the entire effacement, the Lismore Council has passed resolutions expressing regret at the rapid disappearance of native birds and animals. It was suggested that the Government of New South Wales should set aside ample areas of land and water for sanctuaries for the birds, and also that children in the various schools should be continuously impressed with the necessity for the birds' preservation. It was also suggested that a close season of at least five years' duration should be declared for all native game, and a perpetual season for all insectivorous birds.—Sydney "Telegraph," 28th August.

THE Australian Naturalist.

VOL. II.

APRIL 1, 1913.

PART 14.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

4th February, 1913.—The opening meeting of the year was held in the Royal Society's House, Mr. E. S. Edwards, M.A. (President) in the chair. There was a large attendance of members and visitors. The Chairman announced that arrangements had been completed for the amalgamation with the Naturalists' Society, of the Aquarium Society of N. S. Wales. The amalgamation took effect as from the present meeting, and he tendered the members of the Aquarium Society a most cordial welcome. The combination of the smaller societies into one strong one would make for the greater benefit and convenience of members, and for the advancement of our scientific pursuits.

Mr. J. E. Carne, F.G.C., delivered a lecture entitled "A Geologist's Expedition into Papua." The lecture was explanatory of Mr. Carne's recent tour in Papua and other islands of the group, on behalf of the Commonwealth Government, for the purpose of examining and reporting on the occurrence of coal and petroleum oil. Delivered in narrative style, and illustrated by a large series of lantern slides, the lecture proved extremely interesting and instructive. Particularly interesting were the pictures showing petroleum oil bubbling up in pools of water and forming patches floating on the surface. Views were shown of the wonderful volcanic and oil-bearing regions of Borneo, Sumatra, and Java, the great volcanoes of the latter being especially impressive.

Mr. David G. Stead, F.L.S., showed a number of highly interesting exhibits obtained by him during a recent whaling expedition. These embraced (1) Sperm Oil and Spermaceti from the head cavities of the Sperm Whale, *Physeter macrocephalus*. (2) Sections of the Skin of the Humpback Whale (*Megaptera*). (3) Portions of the Integument of the same, showing growths of large Sessile Barnacles or Acorn Shells (*Coronula*), and upon these large clusters of a Stalked Barnacle (*Conchifera*), and also showing the common crustacean Whale Louse (*Cyamus*). (4) Tumorous Swelling from lower jaw of Humpback Whale, with impression left by large *Coronula*. (5) Broken Sections of the Explosive Head of a

great Harpoon taken from the carcase of the Finback Whale (*Balaenoptera physalus*), etc.

Master Oliver Edwards, an interesting collection of beetles from Mount Wellington, Hobart..

Mr. A. Musgrave, a box of miscellaneous insects taken during a three days' visit to Kurrajong, N.S.W.

Mr. Musgrave also contributed a note on Insects occurring on wattles.

Mr. S. J. Moreau, mud nests of wasps, probably *Pelopaeus laetus*, attached to the foliage of a pine tree from Fairfield; described on p. 107 of Froggatt's Australian Insects. The nest contained small jumping spiders.

Specimen of a lizard from Mundooran, on the Castlereagh River, locally called "Wood-adder," and greatly feared; really a harmless ghecko, probably *Oedura robusta*, p. 213, Lucas and Le Souef's Animals of Australia. (See this Vol., p. 168.—Ed.)

Mr. W. M. Carne, an apparent natural graft of *Jasminum lineare*, R.Br., growing on *Eucalyptus hemiphloia*, var *albeus*, White Box.

Miss Mabel N. Brewster contributed a note on the Silver-Stripe Hawk-Moth.

4th March, 1913.—Mr. E. S. Edwards, M.A. (President), in the chair. There was again a very large attendance of members and friends.

The President announced the resignations of the two Hon. Secretaries, Mr. W. G. Davies, on account of his having received a country appointment, and Mr. W. B. Gurney, on account of pressure of official duties. These had been accepted with much regret by the Council, and steps were being taken to fill the vacancies. It was announced that the projected Easter excursion had to be abandoned on account of the very small number who notified the Secretaries of their intention to attend. This was unfortunate, as it now transpired that a party of 30 or 40 could have been made up, and considerable disappointment had resulted through members not letting the Secretaries know in time.

Mr. W. M. Carne read interesting "Notes on some forms of association among plants" and "The secretion of nectar by extra-floral glands in the Genus *Acacia*." A paper by Miss M. Campbell, "Observations on Moth Pupation," was read.

The exhibits were as follows:—Mr. Sherris, ivory nut and fine photo of the trees yielding same, and indicated the value of the nuts commercially for the manufacture of buttons, studs etc. Mr. Froggatt, a collection of Australian Ruby-tail Flies (*Chrysididae*), which are chiefly parasitic on other wasps, etc.

Mr. Le Souef, living chameleon (*Diopsis apicalis*), from Natal. Dr. D'Ombrian, a small crustacean from Shell Cove, Sydney, with a very enlarged chela on one side. Mr. Cheel, fresh fruits of *Eugenia Luehmanni*, with fine flavoured jam made therefrom. Mr. Gurney, micro-slides of larva of Native-cat flea (*Stephanocircus*), the Echidna flea (*Echinophaga ambulans*), and the male and female Cattle Tick (*Margarus australis*).

The following were duly elected members:—Mrs. and Miss Perry, Misses H. Bruce, C. Goulding, Ivy Fox K. Clarke, Messrs. S. J. H. Moreau, H. H. Jobbins, A. C. Hurst,

THE SILVER-STRIPE HAWK-MOTH.

Chaerocampa celerio.

(By Miss Mabel N. Brewster.)

On November 6th the caterpillar, a pale green, with eye spots on hind segments, was feeding on Virginia creeper. On November 15th it began to change colour to a darker shade of green, and by November 16th had turned light brown. On November 17th it pupated. Before pupating it kept very still for a few hours, then began to weave a little compartment of silk, mixed with sand. It was interesting to note the manner in which the caterpillar built its network shelter. After crawling round the box and selecting a suitable position it first made a bare outline with silk. When this foundation was ready the caterpillar started to mix sand with it; standing on the four hind legs, it used its head and front legs for lifting and placing the sand in position. After working steadily for some time, the case was completed, when it nestled down and pupated. The moth hatched out on January 14th, 8 weeks and 2 days after pupation. On account of being able to see the whole process from start to finish, this was the most interesting case of pupation which I have yet witnessed.

OBSERVATIONS ON MOTH PUPATION.

Phalaenoides (Agarista) glycine.

(By Miss M. Campbell.)

In the spring we put the larva of this insect in our insect case. As a rule, these caterpillars spin their cocoons in the soil at the root of a grape vine; but when the time for pupating arrived, the necessary material for house-building was lacking. After travelling restlessly round the case for some

time, the caterpillar settled down in a corner and commenced to chew the wood of the case. This it made into a soft pulp, and used for the cocoon. It was slow work, so we scraped some of the wood with a knife, and offered it as compensation for our neglect. The caterpillar eyed it suspiciously, turned it over once or twice, and then went on with its work—content expressed in every hair.

The next morning the cocoon was only half finished. Towards the end things became quite exciting, and the school children were so interested that they stayed an hour over time to see the finish. The opening of the cocoon was left at the top end, and the caterpillar, working feverishly as if afraid that fate would overtake it too soon, did not seem to be able to fill up the gap, with itself inside. A good deal of time was spent in experimenting, trying to bring the pulped wood from outside. Finally the task was finished by chewing more wood from *inside* the cocoon, and sealing up the hole from the inside.

Antheraea eucalypti.

We had some Emperor Gum moth's eggs in the same case. Although quite a number hatched, they appeared to be delicate, and we only reared one caterpillar. When about three inches long it changed colour, and began to spin its cocoon. We put some silk from a silk-worm's cocoon beside it, and though it appeared to resent our interference and showed fight at first, it used our silk.

The cocoon is old now and stained, and the silk does not show very much; but when it was new the yellow floss could be seen quite plainly, woven through and through the little structure.

NOTES ON SOME FORMS OF ASSOCIATION AMONGST PLANTS, PARTICULARLY IN RE- GARD TO BACTERIAL NODULES AND MYCOR- HIZAE IN AUSTRALIAN PLANTS.

(By W. M. Carne.)

Root Nodules in Legumes. During the latter part of the 19th Century an explanation was found for what Agriculture had long recognised as a fact, namely, that the growth of a leguminous crop results in an increased growth of a succeeding crop, such as cereals or roots. Hellreigel and Wilfarth then demonstrated the power of legumes to assimilate free nitrogen from the air in the soil by the aid of certain bacteria. These organisms, named *Pseudomonas radicola*, live symbiotically in the roots of leguminous plants, forming small

growths, tubercles, or, as they are more popularly known, nodules. If these plants, or even their roots, decay in the soil, the assimilated nitrogen passes to the soil in a form readily available to plants. The change from available to non-available nitrogen is brought about under normal conditions by certain soil bacteria. The result of the leguminous crop is thus to pass to the soil the equivalent of a dressing of nitrogenous manure. The nitrogen becomes slowly available, and has a longer period of effectiveness, and the soil further improves in texture as a result of the incorporation of humus. These facts are largely availed of in agriculture in the use of green manuring and soiling crops.

Nodules Non-leguminous Plants. Besides those on legumes, similar nodules are known in certain *Eleagnaceae*, *Alnus* (the Alder tree), *Podocarpus*, and the *Cycadeae*. Instead of being growths on the roots in these cases, the nodules are formed by distortion of the rootlets. This is probably the origin also of the recently discovered nodules on the River Sheoak (*Casuarina Cunninghamiana*).

Scientific investigation of leguminous nodules has been almost entirely confined to the great pea-flowered sub-family (PAPILIONACEAE). Of this group only the Honey Locust tree (*Gleditschia triacanthos*) has been found free from nodules.

Recently it has been shown that nodules are characteristic of all the sub-families. The following list of Australian legumes found to carry nodules has been compiled from the notes of several observers, and goes to show that the possession of nodules is as characteristic of our legumes as of those of other countries.

In seven cases (indicated †), the bacteria have been demonstrated. In the others the nodules have been considered sufficient evidence of the symbiosis.

PLANTS BEARING ROOT-NODULES.

- Acacia rubida*†—G.P.D.S.*; W.M.C. (Lawson).
decurrens—C.T.M.§ and W.M.C. (Richmond).
 var mollissima†—G.P.D.S.*
melanoxydon—W.M.C. (Kurrajong Heights).
discolor—C.T.M.§ (Kurrajong Heights); W.M.C. (Hunter's Hill).
suaveolens†—G.P.D.S.*; W.M.C. (Terrigal); C.T.M.§ (Sydney).
linearis—C.T.M. (Richmond); W.M.C. (Terrigal).
stricta—W.M.C. (Terrigal).
pruinosa—W.M.C. (Terrigal).

- linifolia*—C.T.M.§ (Richmond); W.M.C. (Wahroonga).
 E.C.†.
juniperina†—G.P.D.S. and W.M.C. (Wahroonga and Narrabeen).
 „ *var Brownii*—C.T.M. (Richmond).
longifolia—C.T.M.§ (Richmond); E.C.†
 W.M.C. (Wahroonga).
elata†—G.P.D.S.*; C.T.M.§ (Kurrajong Heights).
lunata—C.T.M.§ and W.M.C. (Richmond).
myrtifolia—W.M.C. (Narrabeen).
Glycix clandestina† — G.P.D.S.*; W.M.C. (Hunter's Hill);
 C.T.M.§ (Richmond); E.C.†.
Dillwynia ericifolia—C.T.M.§ (Richmond); W.M.C. (Hunter's Hill).
 „ *floribunda*—C.T.M. (Richmond).
Hardenbergia monophylla — C.T.M.§ (Richmond); W.M.C. (Hunter's Hill).
Kennedyia rubicunda† — G.P.D.S.*; C.T.M.§ (Kurrajong Heights); W.M.C. (Hunter's Hill and Narrabeen).
Pultenaea flexilis — C.T.M.§ (Kurrajong Heights); W.M.C. (Terrigal).
Platylobium formosum—W.M.C. (Terrigal).
Oxylobium trilobatum—C.T.M.§ (Kurrajong Heights); W.M.C. (Terrigal).
Gompholobium latifolium—W.M.C. (Terrigal).
 „ *minus*—E.C.† (Hill Top).
 „ *grandiflorum*—C.T.M.§ (Kurrajong Heights);
 W.M.C. (Wahroonga).
Daviesia ulicina—W.M.C. (Terrigal); E.C. (Hill Top).
 „ *alata*—W.M.C. (Wahroonga).
 „ *genistifolia*—C.T.M.§ (Richmond).
 „ *umbellulata*—C.T.M.
Indigofera australis—C.T.M.§ (Richmond); W.M.C. (Terrigal).
Phyllota phyllicoides—W.M.C. (Wahroonga).
Viminaria denudata—W.M.C. (Wahroonga).
Bossia microphylla—W.M.C. (Wahroonga).
 „ *rhombifolia*—C.T.M.§ (Richmond).
Mirbelia reticulata—W.M.C. (Wahroonga).
Jacksonia scoparia—C.T.M.§ (Richmond).
Lotus corniculatus—C.T.M.
Zornia diphylla—C.T.M.§ (Richmond).
Canavalia obtusifolia—E.C.†
Sphærolobium vimineum—E.C. (Hill Top).
Hovea livearis—G.P.D.S.
 W.M.C.—W. M. Carne.
 *G.P.D.S.—G. P. Darrell-Smith. Report of Bureau of Microbiology, N.S.W., for 1910-11. Page 219.
 †E.C.—Edward Cheel. Australian Naturalist, July, 1912, and by letter.
 §C.T.M.—C. T. Musson. Hawkesbury Agricultural College Journal, January, 1905, and by letter.
 †Nodular bacteria demonstrated.

After examining the nodules of several Australian legumes, G. P. Darnell-Smith makes the following remarks:—"The presence of algae-like cells in the root tubercles, and of green colouring matter (chlorophyll?) which has been observed in the parenchyma immediately adjoining the point of attachment of the root-tubercles in lucerne and in clover, suggest that we have to do . . . not with a case of symbiosis peculiar to that natural order (Leguminosae), but with an example of a certain kind of symbiosis, which is common in many other natural orders. Lichens, Mycorrhiza, and Leguminous nodules seem to have certain characters in common."

Symbiosis in Cycadaceae.

It would seem that the nodules examined by Darnell-Smith are intermediate in character between the simple form of symbiosis usually associated with legumes and that found in the Cycadaceae. In these latter plants, *Pseudomonas radicola*, occurs in nodule-like structures formed by distorted rootlets. Beneath the surface is the Algal zone, so-called from the presence of an alga (*Nostoc*). Professor Bottomley has found that *Pseudomonas* is always associated, in the spaces of the Algal zone, with another bacterium (*Azotobacter*). Experimentally, he claims to have shown, that the nitrogen assimilation of the associated bacteria is greater than that of the two acting independently.

In this case four organisms are associated, the cycad and the alga, providing carbonaceous food and the bacteria combined fixing nitrogen. A.B. Rendle (Classification of Flowering Plants), describes the origin of the cycad nodules, "Bacteria enter at the apical region of the rootlets. Rapid swellings follow, and a definite zone of cortical cells is disorganised, forming spaces which communicate with the outside air by lenticel-like apertures. These spaces become filled with *Nostoc*, and the adjacent cells of the cortex send papillate prolongations into it."

Symbiosis Between Green Plants.

Here may be mentioned certain curious associations of chlorophyll-bearing plants. In *Azolla*, some liverworts (as *Anthoceros*), *Lemna* (Duckweed) and *Gunnera* (one of the Haloragidaceae), the two latter flowering plants, the association is with the alga *Nostoc*. What is the value of this association? Is one member a parasite?

Lichens.—In the well-known case of the lichens, the plants, which indeed are not plants in the limited sense of the word, being formed by the association of an *Ascomycete* or *Basidio-mycete* fungus with an alga. The alga provides carbonac-

ous food and in return receives water and mineral food. Still the arrangement is rather one-sided, as the alga can, and does, live independently, whilst the fungus is dependent for life upon the algae being entangled in the meshes of its hyphae. This association of green plants and fungi introduces the subject of *Mycorrhizae*.

Mycorrhiza is the term applied to the symbiotic association of flowering plants (usually) with fungus mycelia, which live in or on their rootlets. Nodules are not formed. *Mycorrhizae* may be ectotrophic, the fungus forming a more or less interwoven feltwork over the rootlets, or endotrophic, living in the cortical tissues.

In some cases, as in the Birds Nest Orchid of Europe, no chlorophyll is formed, though the plant is not a parasite, but receives its carbonaceous food from humus by means of the mycorrhiza on its roots. Usually the host plant is able, under favourable conditions, to maintain itself normally, but as the conditions become unfavourable, so does it become mycotrophic. The mycotrophic condition enables them to utilise organic and mineral soil food not directly available to the plants until made so by the action of the fungi on their roots.

For some time it was thought that mycorrhizae were as limited in their range as the symbiotic association of *Pseudomonas radiculicola*. It is now known to be more associated with certain environmental conditions than any specific groups of plants. Scott Elliott says that almost all trees, numbers of shrubs, and flowering plants, ferns and their prothallia, possess mycorrhizae, but that in the case of liverworts and mosses, it is uncertain whether the fungus is useful or simply parasitic.

C. T. Musson records 25 species of native plants bearing mycorrhizae, and states that in no plant examined were the roots found free from the fungi.

Stahl has found that typically mycotrophic plants have a relatively low transpiration and consequently a low absorption of mineral food. The association is especially characteristic of plants growing in soils subject to drought or poor in mineral salts or rich in humus. Mycotrophic plants are usually of slow growth, with feeble transpiration and limited root development, their leaves rarely contain starch, and the plants are particularly free from mineral salts. Many pines and orchids cannot be raised from seedlings if grown in sterilised soil. The presence of *Mycorrhiza* is necessary to their healthy development.

It must be appreciated that undisorganised organic matter is quite unavailable to non-saprophytic plants. Where con-

ditions are unfavourable for the bacterial action rendering the humus available, the saprophytic mycorrhizae take their place

Mycorrhizae may be useful in three ways to the host plants, and thus indirectly to themselves.

1. Organic and mineral matter may be rendered available.

2. Roots no longer possessing root hairs, may be able to absorb water through the fungus hyphae. Mycotrophic plants are normally poorly supplied with root hairs.

3. Atmospheric nitrogen may be assimilated through the fungus as in the case of *Pseudomonas* in the legumes. This fixation of free nitrogen has been shown in the case of *Podocarpus*, and claimed in regard to certain heaths. Where the fungi have been isolated and determined, they have proved to be species of *Phoma*. Ternetz has shown that three of five species isolated from certain heaths (*Ericaceae*) have a decided capacity for nitrogen fixation in cultures.

That this applies generally to *Mycorrhizae* has still to be proved. It would certainly indicate a similarity of association to that of the legumes and bacteria. Whatever its value, it seems certain that the mycotrophic condition to greater or less degree is common in Australia. Probably it is associated with the drought conditions periodically experienced and possibly to the rather low nitrogen content of our soils.

The study of such associations as these makes us realize again the remarkable complexity of Nature's methods, and the danger that lies in arbitrary divisions too closely applied. Who can draw the line between parasites, saprophytes, and normal terrestrial plants?

Native plants found by C. T. Musson to have mycorrhizae on their roots.

<i>Hibbertia</i> , sp.	Dilleniaceae.
<i>Sida rhombifolia</i> ,	Malvaceae.
<i>Oxylobium trilobatum</i> ,	Leguminosae.
<i>Pultenaea flexilis</i> ,	Leguminosae.
<i>Gastrolobium grandiflorum</i> ,	Leguminosae.
<i>Kennedya rubicunda</i> ,	Leguminosae.
<i>Acacia linifolia</i> ,	Leguminosae.
<i>Eucalyptus</i> sp.,	Myrtaceae.
<i>Helichrysum lucidum</i> ,	Compositae.
<i>Panax sambucifolius</i> ,	Araliaceae.
<i>Goodenia ovata</i> ,	Goodeniaceae.
<i>Epacris</i> , sp.,	Epacrideae.
<i>Myrsine variabilis</i> ,	Myrsinaceae.
<i>Lyonsia lilacina</i> ,	Apocynae.
<i>Erythraea australis</i> ,	Gentianeae.

<i>Veronica plebeia</i> ,	Schrophularineae.
<i>Ruellia australis</i> ,	Acanthaceae.
<i>Prostanthera denticulata</i> ,	Labiatae.
<i>Muhlenbeckia gracillima</i> ,	Polygonaciae.
<i>Pimelia linifolia</i> ,	Thymeleae.
<i>Beyeria viscosa</i> ,	Euphorbiaceae.
<i>Croton verreauxii</i> ,	Euphorbiaceae.
<i>Dipodium punctatum</i> ,	Orchideae.
<i>Microtis porrifolia</i> ,	Orchideae
<i>Wurmbea dioica</i> ,	Liliaceae.

THE SECRETION OF NECTAR BY EXTRA-FLORAL GLANDS IN THE GENUS *ACACIA* (WATTLES).

(By W. M. Carne.)

Though the real explanation of nectar producing glands in plants may not be quite understood, it is certain that though in many cases the secretion is intimately connected with fertilisation by insects, such a use is secondary, and is not the original cause.

The following observations were made of the extra-floral nectaries of *Acacia* to see whether they secreted, and if so, whether they played any part in the fertilisation of the flowers.

Extra floral glands are common in the genus and occur on the phyllodes and leaf stalks, or at the points of attachment of the pinnæ, or even on floral peduncles either flower-bearing or reduced simply to a gland-bearing organ.

It will be noticed that there appears to be no rule in regard to nectar-secretions and flowering. Nectar is produced in the glands of the younger leaves of strongly growing plants. The secretion is probably determined largely by seasonal conditions.

In *Acacia discolor*, nectar is copiously yielded by large glands on aborted flower-stalks. So close are the flowers that the bees which visit the glands freely may at times cause fertilisation. It is hard to see any such use where the glands and flowers are widely separated.

<i>Species.</i>	<i>Position of Active Glands.</i>	<i>State of Plant</i>	<i>Observer.</i>
<i>Acacia elata</i> ,	on leaf petiole,	not in flower,	C.T.M. & W.M.C.
<i>suaveolens</i> ,	young phyllodes,	flowering,	C.T.M. & W.M.C.
<i>longifolia</i> ,	phyllodes,	not in flower,	C.T.M. & W.M.C.
<i>discolor</i> ,	{ leaves and aborted floral peduncles,	{ flowering,	C.T.M. & W.M.C.
<i>falcata</i> ,	phyllodes,	in fruit,	C.T.M.
<i>myrtifolia</i> ,	phyllodes,		C.T.M.
<i>glaucescens</i> ,	phyllodes,	in fruit,	W.M.C.
<i>rubida</i> ,	phyllodes,	in flower,	W.M.C.
<i>linifolia</i> ,	phyllodes,	in flower,	W.M.C.
	C.T.M.:	C.T. Musson.	
	W.M.C.:	W. M. Carne.	

BIRD NOTES.

(By D. G. Stead, F.L.S.)

ROCKWARBLER ("ROCK ROBIN"), *Origma rubricata*. This charming little bird is rarely to be seen in the gullies and about the ranges in the Blue Mountains. It is abundant in the vicinity of Jenolan Caves, and numbers are to be seen along the various walks, as well as about the Grand Arch, the Carlotta Arch, and the outer caves. They have become used to the visitors, and will approach quite close on the lookout for stray bits of food. In the Grand Arch they form a very effective contrast to the great chasm, revealing it in all its greatness.

We have very many instances around us of the trustfulness of the wild birds, once they find they will be protected, and in the case of the dear little Rock Warblers at Jenolan, we find a particular striking example of this; for one pair has built a nest in the little galvanised iron dynamo shed, immediately below the dam at the Grand Arch. Not only is this nest built in the shed, but is attached, pendent, to the electric wires running up from the dynamo, and within a few feet of the latter, within close reach of anyone entering, and right against the place where the mechanic works when attending daily to the dynamo.

While carrying out some investigations recently on the Kangaroo River, at Kangaroo Valley, I was pleased to see a pair of this little *Origma* on the bluff face of the cliff, immediately beneath the fine suspension bridge which crosses at Kangaroo Valley.

I will be glad to hear of any well-authenticated records of this rarely observed bird. As very few observers have been able to note this sweet little bird, the following color notes are offered to assist in identifying it. Above, deep brownish; very dark and almost black on the tail; head, almost reddish brown; throat, whitish or grayish, and the rest of the lower surface ferruginous or reddish brown.

PIED BELL MAGPIE ("BLACK MAGPIE"), *Strepera graculina*: This fine-looking bird is far more abundant than is generally supposed. I have observed it in a great many places in the central (mountainous) division and coastal portions of New South Wales as well as in some of the western parts. It lives largely, when possible, on wild and—if available—cultivated fruits. Its clear, loud and quaint call may be heard a great distance off in the mountain gullies. The bird is frequently known as "To-morrow-bird" on account of its call ("To-morrow, to-morrow," more correctly "Kurrula-Kurrula, Kurra-Kurra"), Kurrawong and Rain-bird (because it often appears before rain). When viewed from beneath, while it is in flight, there are to be seen three conspicuous white sub-circular patches—one on each wing and one about the base of the tail. The bird is at times a great thief, as it will fly into houses and carry off food.

The Pied Bell Magpie has probably of late brought itself more under the personal notice of visitors to these shores from other countries than any other Australian bird. In the aggregate now, thousands of visitors of several nationalities who have been "doing" Jenolan Caves, have been greatly interested in the bird and its loud quaint call, and many enquiries have been made as to the nature of the bird, which frequently becomes quite bold at this spot. The call is decidedly pleasing when heard coming from tree top, mountain-side, or over a patch of water.

Though commonly found at considerable altitudes in New South Wales, my experience shows that it is not such an upland form as its congener, the Grey Bell Magpie.

GREY BELL MAGPIE ("GREY MAGPIE"), *Strepera versicolor*: I have found this species to be most abundant in our southern uplands, from an altitude of about 2,000 feet to 5,000 feet (the latter on the slopes of Kosciusko—late summer and autumn). Like the Pied Bell Magpie, it is by preference a fruit eater. Mr. Leach, in his "Australian Bird Book," gives the call as "Cree-e-ling, Cree-e-ling." This, with the accent on the "ling," gives a fair imitation of the bird's principal call. It appears to be of a somewhat inquisitive disposition, and when in the low timber will come fairly close and peep round the

branches at the intruder. The white spots on the wing-feathers help to give this bird a very handsome appearance as it flies from tree to tree.

One of its calls sounds remarkably like "Here-you-are, Here-you-are," and another like "Bai Jove, Bai Jove." If one of the birds should be wounded, a large flock will generally speedily congregate and will set up the latter call.

This fine-looking bird is cordially hated by fruit growers on the uplands or on lands adjacent thereto.

WHITE-WINGED CHOUGH (*Corcorax melanorhamphus*): This interesting bird I have observed in many parts of the western country (from the Murray to the Parwon) and the Central Division of New South Wales. It appears to be particularly abundant, however, in the former. On account of the habit of banding together in small flocks, and, while doing so, incessantly chattering and whistling (a mournful down-scale whistle), it is often called "Happy Family" and "Twelve Apostles"—names which properly apply to other species. Because of a certain suggestion of the Pied Bell-Magpie in its appearance, it is frequently called "Black Magpie," a term properly applied, though not recognised, as a good vernacular name to *Strepera graculina*. From the latter, however, it is always easily distinguished. It is much smaller, is a short-flight bird, has a much smaller and considerably-curved beak (that of the Pied Bell-Magpie being stout and straight), has large patches of white under each wing (on the outer half) and hops and flits from bough to bough in a way quite unlike any of the Bell-Magpies. In parts of Western New South Wales this bird is called the "Black Jay," or simply "Jay" (again somewhat loosely applied names).

This bird, while abundant on certain parts of the plain country, is found at considerable altitudes, and can put up with very cold conditions. I remember seeing a flock of these near Porcupine Hill, between Oberon and Jenolan, on a cold winter's day in June last. At the time there were very few birds visible, as most of them had got down to the protection of the gullies, there being a cold, biting wind at the time of a temperature, as I found and felt, but little above freezing. I have seen the bird also high up on the slopes of the Kosciuszko plateau (6000ft.).

The White-winged Chough is interesting as being one of the few of our birds that build mud-nests. While being of a most harmless and non-destructive nature, this bird is of very quaint and interesting habits. Some time since I was greatly surprised to see a man with a gun "potting at" a flock of these in a tree a few miles out of Narrandera. The poor birds

did not fly away (they are nearly always very "tame"), but remained to be shot at. Needless to say, I expressed my surprise in no uncertain terms, and the man—for the time being anyway—desisted.

WHITE-BACKED MAGPIE (*Gymnorhina leuconota*): This bird makes its way down from the Monaro district as far as Tumut, but very rarely. While travelling through from Tumut to Talbingo in July last, I was pleased to see occasional examples among the common Black-backed form, from a few miles out from the former place on towards the latter, becoming more noticeable the higher I went. I learnt that one pair had nested right in Tumut last year.

SPOTTED GROUND BIRD (*Unclosoma punctatum*): Since writing my previous note on this beautiful bird (p. 169), I have had other opportunities of seeing it. One was shot in the valley of Jounama Creek last year by a "sport" (the kind of "sport" that shoots "Willy Wag-tails"), and was brought to me at Talbingo to identify. The local people had not seen one before. While walking along the road from Titania to Oberon, in August of last year, I saw a flock of eight of these picking about at the roadside in one place, while others were visible here and there. There had been a light sprinkling of snow, and these birds looked very charming as they ran quickly to cover and then later spread out in low flight with a loud whirring noise. In December last I again saw this bird at Kangaroo Valley, and during September, 1912, on the slopes of Kosciusko at an altitude of about 4000 feet.

NOTES AND COMMENTS.

NEW ENTOZOA FROM AN AUSTRALIAN SHARK: Students of Cestoda will note that J. Hornell has described two new Cestodes from the gut of *Stegostoma tigrinum*, a species of shark which occurs along parts of the Australian coastline, and is therefore of special interest to us. The species described are *Balanobothrium tenu* and *Tetrarhynchus annandalei*. Both are figured and described in a paper entitled "New Cestodes from Indian Fishes," appearing in the "Records of the Indian Museum," Vol. VII., part 2, 1912. —D.J.S.

APPARENT NATURAL GRAFT: *Jasminum lineare*, R. Br., growing as an apparent natural graft on *Eucalyptus hemiphylloia* var *albeus*, White Box. A broken limb, a chance seed and favourable conditions are the probable explanation of this apparent parasitism. It must be admitted the junction of the Jasmine and the Eucalypt shows no indications of a

broken branch, the sapwood of the tree having grown tightly around the stem of the smaller plant.

The tendency for the heartwood of our hardwoods to decay makes these so-called natural grafts not rare. Sometimes as in the well-known case at Hawkesbury College, the graft grows so fast as to split open the host plant.

—W. M. CARNE.

INSECTS ON WATTLES: Collecting at Kurrajong on January 25th, I was successful in taking some beetles not recorded in Mr. Gurney's "List of Insects on Wattle Trees" (Aust. Nat. Vol. ii., p. 58). The species are as follows:—*Diphucephala rufipes*, Waterh. found on dying flowers; *Ditropidus canescens*, Chap. on foliage; and *Orcus australasiae*, Boisd., this latter apparently preying on scale insects. Further, I took *Chalcopterus variabilis*, Bless., which was very common, numbers of individuals being present on nearly every tree (wattle) in the district, running about or sunning themselves on the trunks.

A. MUSGRAVE.

Coccinella transversalis: Some years ago I found, at Richmond, N.S. Wales, this common ladybird beetle feeding on secretions from the glands on the tips and main stems of Cowpea. Possibly such secretions of plants are important food supplies to aphids and scale-eating ladybirds in the absence of their particular insect food.

—W. B. GURNEY.

FEATHERED FRIENDS.

(Birds Protected Until 1924.)

It is notified in the "Gazette" that the following birds have (under the provisions of the Birds Protection Act) been absolutely protected for the whole State until June 30, 1924:—

Skylark (English), white-bellied sea eagle, seagulls of every description, brush turkey, bustard or plain turkey, stone

plover or land curlew, wonga pigeon, peewit or magpie, lark, emu, wren, ibis; rifle bird, regent bower-bird, grey shrike-thrush, rufous-breasted shrike-thrush, black-faced cuckoo-shrike, varied cuckoo-shrike, ground cuckoo-shrike.

Jardine's caterpillar eater, white-eyebrowed caterpillar-eater, white-shouldered caterpillar-eater, white-shafted fantail, rufous-fronted fantail, black and white fantail (wagtail), restless flycatcher (wagtail), lead-coloured flycatcher, shining flycatcher, brown flycatcher (Jacky Winter), black-faced flycatcher, black-fronted flycatcher.

Rose-breasted robin, scarlet-breasted robin, flame-breasted robin, red-capped robin, hooded robin, large-headed robin, yellow-breasted robin, golden-rumped robin, superb warbler or "blue wren," black-backed superb warbler, turquoise superb warbler, white-winged superb warbler, white-backed superb warbler, Lambert's superb warbler, purple-backed superb warbler, scarlet-backed superb warbler, purple-backed superb bill, scrub thorn-bill, rufous-rumped thorn-bill, striped-crowned thorn-bill, chestnut-rumped thorn-bill, yellow-rumped thorn-bill, buff-rumped thorn-bill.

Brown singing lark (sky-lark), rufous-rumped, singing lark (sky-lark), Horsfield's bush lark, Australian pipit (often locally called "ground lark"), coach-whip bird, grey-crowned chatterer, white-eyebrowed chatterer, chestnut-crowned chatterer, brown tree-creeper, white-throated tree-creeper, red-eyebrowed tree-creeper, white-eyebrowed tree-creeper, welcome swallow, tree swallow, white-breasted swallow, fairy martin, noisy pitta or "dragoon bird."

Lyre-bird, Prince Albert's lyre-bird, Queen Victoria's lyre-bird, bell-bird, white-throated night-jar, spotted night-jar, tawny-shouldered frogmouth, plumed frogmouth, owl night-jar, azure king-fisher, sacred king-fisher, red-rumped king-fisher, Macleay king-fisher, great brown or "laughing jack-ass."

Pallid cuckoo, fan-tailed cuckoo, brush cuckoo, bronze cuckoo, rufous-tailed bronze cuckoo, black-eared cuckoo, gang-gang cockatoo, Banks' black cockatoo, Leach's black cockatoo, yellow-tailed black cockatoo, masked owl, sooty owl, grass owl, delicate owl, boobook owl, spotted owl, powerful owl.

Egret, plumed egret, pacific heron, nankeen night heron (or nankeen crane), straw-necked ibis, white ibis, glossy ibis, sanguineous honey-eater or "blood bird," Bourke's grass parakeet, satin bower bird, cat-bird, spotted cat-bird.

THE

Australian Naturalist.

VOL. II.

JULY 1, 1913.

PART 15.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

ORDINARY MEETINGS.

1st April, 1913.—Mr. E. S. Edwards (president) in the chair. The following were duly elected members:—Misses K. Clarke, A. E. Hurst, Mr. and Mrs. Fincham Turner, Messrs. F. W. Carpenter, M.A., W. Lockhardt, L. Abrahams, D. R. Fleming, Master M. Pell.

Mr. W. W. Froggatt exhibited a general collection of insects captured on the flowers of *Angophora*, between Como and Sutherland, during 1912. Mr. A. A. Hamilton contributed notes on some interesting plants from the Napier River. Mr. E. Cheel delivered a lecture on "Variations in Plant Life," and exhibited a series of specimens in illustration. These included specimens of the so-called viviparous growth in grasses, showing the plantlets in various stages of growth, a number of legume seeds showing variation in the colour of the seed-coats, seedling plants, together with herbarium specimens of the "Kangaroo grass"; also a living hybrid *Callistemon acuminatus*. *C. lanceolatus*, raised from seed sown in September, 1912.

6th May, 1913.—Royal Society's House, Mr. E. S. Edwards, M.A. (president) in the chair. Miss E. Upfold was elected a member. Mr. D. G. Stead, F.L.S., exhibited examples of minnows, *Galaxias scriba* Cuv. et Val., from Paterson River; *G. Coxii*, Macleay, from Ourimbah Creek; *G. planiceps*, Macleay, from Cudgegong River, and made critical remarks thereon; preserved specimen of *Dacelo gigas* with descriptive note, and presented a note on Dolphins and Sharks. Mr. A. A. Hamilton, some interesting species of Goodeniaceae with notes. Mr. E. Cheel, herbarium specimens of *Tetratheca pilosa* var *denticulata* and *Boronia polygalifolia* var *robusta*, together with *T. ericifolia* and *B. polygalifolia* for comparison. Miss Busby, specimens of fungi which Mr. Cheel explained were Phosphorescent Agarics (*Pleurotus candescens*). Mr. C. H. Wickham, a series of the life histories of moths. Mr. W. W. Froggett, F.L.S., flowers of Oleander, with trapped insects, chiefly flies. Mr. H. J. Carter, B.A., a box of beetles from the British Museum collections. Mr. A. Musgrave, a twig having attached germinating seeds of mistletoe (*Loranthus*). Mr. Cheel showed, on behalf of Miss C. le Plastrier, an Agaric having a strong iodoform-like odour, and on behalf of Mr. Carruthers, speci

mens of *Cosmos bipinnatifolia*, from Arncliffe, in which the majority of the flowers showed marked proliferous growth.

Mr. J. M. Petrie, D.Sc., F.I.C., Linnean Macleay Fellow in Bio-chemistry, gave an exceedingly attractive lecture entitled: "The Romance of Chemistry." He exhaustively explained the nature of Sir Oliver Lodge's ether corpuscles, and the electron. The atom was a complex world in itself, revolving, vibrating, and flying about, aggregating into more complex atoms till the heaviest lost their internal cohesion, and burst again into electrons. Then came the molecule formed by the union of atoms, and constituting all known substances. "There is a romance running through all these that we seldom dream of," said Dr. Petrie. "In thinking of the vast energy stored in a single atom, remember that whenever we have bodies rotating with infinite high velocities, a musical note is produced as in the hum of the gyroscope. Each rotating electron must be singing its own song, and for ever. Shakespeare wrote the music of the spheres:—"There's not the smallest orb which thou behold'st, but in his nature like an angel sings." So we can think of the tiny worlds, like the poet's celestial orbs:—

"For ever singing as they shine,
The hand that made us is divine."

The lecture was listened to with the greatest interest, and was very highly appreciated.

3rd June, 1913.—Mr. E. S. Edwards, M.A. (president) in the chair, present about 70 members and visitors. The following were unanimously elected members:—Miss C. Le Plaistrier, Messrs. G. F. Maguire, G. C. Currie, P. L. Harris, T. D. Mutch, and the Ven. Archdeacon F. E. Haviland.

A lecture was delivered by Mr. G. A. Waterhouse, B.E., B.Sc., F.E.S., on "The Geographical Distribution of Butterflies," which was illustrated with a fine series of specimens.

Mr. D. G. Stead, F.L.S., exhibited a portable hot-air pump for use in aquaria, and contributed "Bird Notes" and a note on "Temporary Sterility in the Rainbow Trout." Miss F. Sulman, a fine collection of New Zealand herbarium specimens and read notes thereon. Mr. A. A. Hamilton, specimens of six interesting plants with notes. Miss Mabel Brewster, the life history of a dipterous parasite of the "Woolly Bear" caterpillar. Mr. E. Cheel, two species of clover infested with clover rust (*Uromyces trifolii*) and an interesting undetermined fungus producing sclerotia, very similar to those of the so-called "Black-fellows' Bread" (*Polyporus mylittae*); a *Leucopogon* collected at Mount Kosciusko by Mr. Stead.

VARIATIONS IN PLANT LIFE.

By Edwin Cheel.

(Synopsis).

In our rambles through the bush in search of wild flowers for botanical study, we find a remarkable variation in the form and colour of the flowers and foliage, as well as in the habit of the plants, and yet there is very little difficulty in tracing a resemblance between certain plants, as there is a similarity in the general structure of the floral organ and fruits. It is owing to the general resemblance in the structure of the flowers and fruits that plants are arranged into families, genera and species. If we take a given species, and examine the members of that species carefully, it will very probably be found that a large number of the individuals of what is by most botanists regarded as a certain species, differ so very much, that several well-marked varieties, or forms, may be distinguished, and advantage is occasionally taken in such cases to establish what is known as sub-species or varieties, whereby the particular plants so separated receive separate names to distinguish them from the normal or type species. It is chiefly through variations of this kind that we have so many different forms and colours among our garden plants, such as we see in roses, carnations, cabbages, beans, peas, and numerous kinds of cereals, all of which have at some remote period been found in a wild state, and through intense cultivation for very many years, and by the interpollination of the various forms with one another, we are scarcely able at times to identify them as belonging to any known species described in botanical literature.

It is frequently found that in many of the plants cultivated, that the characters are so unstable, that the colour of the flowers, and the form of the leaves, are entirely different from that of the parent plant; this applies more especially to roses, apples, peaches, etc., so that in such cases it is very difficult to form a classification so as to keep a record of the forms. In other cases, as for example in wheat, barley, and beans, the characters become fixed, that is to say, the character of the seedlings and ultimate crop, are exactly the same as the parent forms; these are what are termed "races" and experienced nurserymen are ever on the alert for improved forms with fixed characters, so as to swell their catalogue with new "trade-names," such as we see in the large series of French Beans which I exhibit to-night, all of which belong to the species *Phaseolus vulgaris*, but differ from one another in the colour of the seed-coat, and perhaps in habit of growth, or the quality or quantity produced by the respective forms.

In some cases, these "trade-forms" may be propagated for many years, and their distinctive character remain consistent, but if they are in any way neglected, and grown with-

out special manures, they may lose their distinctive character which originally distinguished them from the rest; this is what is known as "atavism," or the reversion to its ancestral or primitive form.

When a special kind of rose or tuber has been produced by artificial means, it is not always possible to reproduce it from seed, so that in such cases it has been found necessary to propagate by budding or grafting on special stocks, or by striking from cuttings, or in tubers or herbaceous plants, by dividing them into "sets." It will be gathered from the above that what is frequently known as variation is in reality a process of evolution, which is more rapid when aided by artificial means, than is the case in a state of Nature.

In Australian plants there is the same tendency to vary as in those mentioned above. A few examples worthy of special mention, are as follows:—The Native Rose (*Boronia serrulata*) has normally bright red-coloured flowers, but I have seen specimens having pure white flowers.

Patersonia sericea, has usually bright blue-coloured flowers, but some few years ago I gathered a specimen with a pure white flower, growing at Hornsby. Last year, a Waratah (*Telopea speciosissima*) was brought in the National Herbarium, having pure white flowers instead of the usually bright crimson.

Tetralthea thumifolia, and *Eriostemon salicifolius*, have frequently been collected with white flowers

Another peculiar form of variation worthy of mention is a fairly common fern (*Blechnum cartilagineum*), which had the fronds beautifully bi-pinnatifid instead of simply pinnatifid. This I found growing near Cundletown on the Manning River, specimens are incorporated in the National Herbarium. In Europe, professional horticulturists would take advantage of these interesting forms, and would propagate them extensively, so as to perpetuate them with a view of getting further variations.

Dimorphic and Polymorphic Forms.—In addition to the variations mentioned above, we frequently find certain species having two kinds (Dimorphic) of flowers, and others having several (Polymorphic) kinds of flowers or other characters. An example of this kind has recently been brought under notice by T. Steel, F.L.S., who has published an interesting paper entitled "Notes on Variable Dioecism in *Pittosporum undulatum*," in the proceedings of the Linnean Society of N.S.W. (1911), p. 329.

This is an unusual form of dioecism, as each kind of flower has a pistil, but the individual plants which set fruits have apparently almost obsolete stamens, while those flowers that have perfect stamens do not set fruits, although the ovar-

ies seem to be fully formed, thus the latter kind show a tendency to become what is known as "hercogamous," that is to say, the apparently hermaphrodite flowers have some peculiar structural or physiological peculiarity, which prevents fertilization.

Similar dimorphic conditions in species have been noted in Great Britain, by Charles Darwin, who has published some very interesting observations in connection with certain species of *Primula*.

Some few years ago I found that some plants of *Lepyrodia scariosa*, which belongs to the family Restiaceæ, had hermaphrodite flowers, while other plants had only male or female flowers. This may be regarded as a polymorphic species, or, perhaps some would prefer to call it "polyoecious."

It has long been known that the cultivated strawberry, has different kinds of flowers, and necessitated careful attention being paid to the different kinds in forming new plantations, so as to get the best results.

Some plants have pistillate flowers with imperfect stamens, some have staminate flowers with imperfect pistils, others have hermaphrodite flowers (stamens and pistils perfect in each flower), while a fourth kind have staminate and pistillate flowers on the same individual plant.

Abnormal Variations.—It not infrequently happens that certain parts of a plant have peculiar growths, such as swollen or distorted branches, or corollas, or the leaves may be more or less disfigured with numerous pustules, or striations. These are what may be termed "Abnormal growths," and in a number of instances are induced by fungus or insect pests. The hyphæ of fungus growing in the intercellular spaces among the palisade and pulp parenchyma cells, frequently cause these peculiar distortions, and ultimately rupture the epidermis of leaves, such as we see in the common Flat Weed (*Hypochaeris*) infested with *Puccinia hypochaeridis*, and the common Couch Grass *Cynodon dactylon* infested with a smut (*Ustilago cynodontis*). In the same way, the hyphæ of other fungi cause distortions in the solid wood, such as we see in several Acacias, caused by the Gall Fungus (*Uromycladium*), and many other trees by the "Bracket Fungi," such as *Fomes* and *Polyporus*.

Variegation.—There is another form of variation frequently met with in cultivated plants, and occasionally in wild plants. A few months ago my attention was drawn to a branch of *Brachylaena nerifolia*, in a plantation in the Botanic Gardens, near the sea wall, having beautiful variegated leaves. I suggested that the branch should be layered, and the result is a beautiful plant has been separated and is now growing in a flower pot.

Leafy Spikelets in Grasses (so-called Viviparous growth):

—In several species of grasses, a peculiar growth has been found, which upon examination reveals the fact that the glumes of the spikelets are transformed into small leafy shoots, which are provided at the base with the beginnings of roots. This peculiar growth is quite common in Europe on certain species of grasses, and was described by Sinclair, in his *Hor-tus Gramineus Woburnensis* (1825) p. 260, as "Viviparous Growth."

Some specimens of *Festuca* growing at the Hawkesbury Agricultural College, Richmond, were collected some few years ago by Mr. C. T. Musson, and quite recently I found a plant of *Festuca ovina* in the Botanic Gardens, Sydney, with this peculiar growth, and have succeeded in getting a series of specimens in all stages of development, showing the minute plantlet taken fresh from the inflorescence, and another which had been placed on damp soil with the rootlets just developed, and others which had been left in the damp soil, developed into fine plants.

Another extremely interesting specimen, showing this peculiar growth, was forwarded to me from Dalgety, in 1911, by Mr. H. Kelly.

The latter specimen appears to be *Agrostis vulgaris*, but as the inflorescence was wholly transformed into these leafy shoots, and not a single perfect flower could be found, it is very difficult to determine the plant definitely. Mr. F. Manson Bailey, Colonial Botanist of Queensland, has also recorded this peculiar development in *Sporobolus Benthami*, found in Queensland.

Variation in the Kangaroo Grass.—The "Kangaroo Grass" is familiar to very many people in Australia, especially to the pastoralists, as it is generally considered by them to be one of the most useful species of our indigenous grasses. If we examine the specimens of this grass found in the neighbourhood of Sydney, we will find that they are more slender, and that the leaf-sheaths and involucreal spikelets are perfectly glabrous, whereas specimens on the tablelands in the neighbourhood of Hill Top, Colo, and Mittagong, have the leaf-sheaths, and involucreal spikelets, and in some specimens the leafy bracts also, all more or less covered with tubercle-based bristles.

This difference may be regarded by some botanists as insufficient for specific differences, while others would establish a species on the evidence submitted above.

It is interesting to note, however, that the seedlings raised from each kind, and grown in the same soil at Hill Top, have developed the same characteristics as the parent forms.

In Bentham's *Flora Australiensis*, there are two species recorded, namely, *Anthistiria ciliata* and *A. frondosa*.

It has been pointed out by Dr. Otto Stapf, that the *A.*

ciliata of Benthams, is not the *A. ciliata* of Linnaeus, as the latter is a native of India and of annual duration only, whereas the Australian plants are of perennial growth as is well known to Australian botanists. Dr. Stapf considers that the Australian specimens named by Benthams as *A. ciliata*, are the same as the plants found in Africa, and originally described under the name *A. imberbis*, Retz., about 1786, and that *A. frondosa*, of Robert Brown and Benthams, are identical with *A. arguens* of Willdenow.

Professor Edouard Hackel, a German specialist on grasses, included the Kangaroo Grass as well as the closely allied species found in Africa, under the genus *Themeda*, which was founded by Forskal in 1775, just about four years prior to the genus *Anthistiria*, founded by Linnaeus in 1779.

The specific name *Arguens*, is retained by Hackel for the "Leafy Kangaroo Grass" found in the northern parts of Australia, but the "Common Kangaroo Grass" is divided into two sub-species, and four forms as follows:—*Themeda Forskalii*, Hack, var. *vulgaris*, which included some West Australian specimens, collected by Preiss; and *T. Forskalii*, Hack, var. *imberbis*, which includes three forms as follows:—

- (1) *typica*. The Port Jackson specimens.
- (2) *caespitosa*. Some West Australian forms.
- (3) *grandiflora*. Some Tasmanian forms.

It will be seen from the above that there is a wide difference of opinion between three very distinguished botanists, and that there is need for further investigation in connection with the "Kangaroo Grass" which when properly worked out may be found to consist of more than two species. These forms may also be of extreme importance to the Hybridist, as there should be no difficulty in crossing the various forms, which are evidently very closely interwoven with each other, if not specifically distinct.

SOME INTERESTING SPECIES OF THE NAT. ORD. GOODENIACEAE.

By A. A. Hamilton.

Goodenia dimorpha, Maiden and Betcher. (Blackheath.) A plant with rosetted basal leaves which are doubtless the result of environment. Growing in unstable boggy soil, and subject to the pressure of strong winds, the flattened appressed leaves act as a balance to the plant to prevent its overthrow. A named var. of this species (var. *angustifolia*) by the same authors, comes from the National Park. Both the species

and var., are described in the Proc. Linn. Soc. N.S.W., 1903, p. 907, in "Notes from the Bot. Gar., Maiden and Betche."

G. decurrens, R. Br.—Usually found growing on the face of dripping rocks, or other moist situations, in mountain gullies, at an elevation seldom below 1000 ft. This species provides one of the surprises met with in the cultivation of our Native Flora. We might reasonably conclude from its natural environment that it would prove to be a difficult horticultural subject; on the contrary it grows freely in the coastal sand belt in the Port Jackson district, and will tolerate a considerable spell of drought. Grown as a pot plant in the bushhouse, it will, with moderate care, reward the grower with a profusion of handsome flower-spikes. It may be grown from seeds, which germinate freely. The seedlings are hardy and not difficult to transplant.

Brunonia australis, Sm. (near "Govett's Leap," Blackheath).—A pretty herbaceous plant, resembling a Composite, with a head of small flowers of a "Forget-me-Not" blue. The writer has not succeeded in germinating seeds of this species, but it is easily grown from offsets in the same way that one divides the plants of the garden "Daisy," (*Bellis perennis*, Linn. and vars.).

Velleya montana, J. Hook. (Medlow, 3/1/1903).—A diminutive plant with the flowers snugly tucked in amongst the tuft of basal leaves, in search of shelter from the rigorous climatic conditions obtaining in the alpine regions to which it undoubtedly belongs. It is known from the mountains in Tasmania and the Australian Alps, but had not previously been collected on the Blue Mts.

V. spatulata, R. Br.—Two very decided forms of this species have been collected by the writer, one, at the National Park, Mar., 1900 (on a dry hillside), an upright plant, with radical leaves 4 inches long, finely toothed all round the margin, and a loose, open inflorescence, with few flowers; the other from Narrabeen, April, 1900 (in a swamp), with radical leaves only 1 in. long, the margins entire or with a few blunt teeth at the apex, the branches of the inflorescence crowded and the flowers comparatively numerous.

The adaptation to an unstable foothold is again exemplified, in the case of the swamp form, with its leaves spreading on the ground and its decumbent stems twining through the rushes and other swamp vegetation in search of support. The description of this species given in the *Fl. Austr.* is sufficiently elastic to admit both these forms, whose variable characterisation may reasonably be attributed to the difference in the conditions of their habitat. It is essentially a northern species, and previous to the above collections was not known south of Newcastle.

SOME INTERESTING PLANTS FROM THE NEPEAN RIVER.

Prostanthera incana, Cunn.—This is a very handsome shrub, and several attempts have been made to add it to our garden flora. The seeds germinate freely, but there is a deplorable mortality amongst the transplanted seedlings. When grown in pots and allowed to remain in them the plants languish, and finally wither away.

A. Violacea, R. Br.—This species is of more interest from a botanical than a horticultural point of view.

Isotoma axillaris, Lindl.—A pretty little herbaceous plant, closely related to the well-known *Lobelia* of our gardens. It grows freely from either seeds or cuttings.

Myoporum floribundum, Cunn.—In the *Fl. Austr.* this species is recorded only from the Nepean River, in N.S.W., and the Snowy in Vic. It has since been found on the coastal rivers (Shoalhaven, etc.), between these localities. It is a showy plant with a powerful odour, pleasant or the reverse (as is the case with many of our odoriferous plants), according to the impression made on the olfactory nerves of those who come in contact with it. The writer has not tested its cultivable qualifications.

Anthocercis albicans, Cunn.—An attractive shrub, the young shoots of an ashy grey colour. Growing on the banks of sand and detritus in the bed of the river at Douglas Park. Previous to this collection it had not been recorded from the eastern slopes of the "Great Divide."

A. scabrella, Benth.—Known only from the Nepean until 1901, when it was collected at Wallangarra by Mr. J. L. Boorman, of the Sydney Botanic Gardens, and recorded in the Proc. Linn. Soc., 1902. "Notes from the Botanic Gardens." Maiden and Betcher.

A. Eadesii, F. v. M.—The only locality given for this species in the *Fl. Austr.* is, near Camden, collected by McArthur. In Moore's "Handbook" the range is extended, but no other specific locality is given.

Didymotheca thesioides, Hook.—The male plant only was seen of this interesting dioecious species, which had not been found previously in N.S. Wales.

Tmesipteris tannensis, Benth.—Usually an epiphyte on the trunks of trees. On the "Nepean" it specially favors the Tree Ferns.

Heleocharis cylindrostachys, Boeck. (Douglas Park).—Previous to this collection not recorded from this locality. It has occurred to the writer that our Rushes and Sedges are not as much in evidence for decorative purposes as they deserve to be. Some effective "Studies in Black and Brown" may be obtained from combinations of our Restiaceae, Juncaceae, and Cyperaceae.

Zornia diphylla, Pers.—A quaint dwarf leguminous plant, its flowers almost hidden between the two large bracteoles. Its range is given as from Parramatta to Queensland. The writer has collected this species at various points on the Nepean, from Emu Plains to Douglas Park.

Solanum campanulatum, R. Br. (Douglas Park).—This species is not of a gregarious habit, but is found isolated in comparatively distant places. It is noted (with other localities) in the *Fl. Austr.* from the Grose Valley, and has been collected at Erskine Creek. These, together with the locality now given (which is the farthest south), are widely separated localities on the Nepean-Hawkesbury.

EXCURSION TO KOGARAH, APRIL 5th, 1913.

The weather was dull and cloudy, but over 30 members and friends attended the excursion led by Messrs. E. Checl and W. B. Gurney.

The object of the excursion was to collect fresh specimens of a *Scirpus* collected in swampy places behind Moore's Racecourse in November, 1899, and recently described as a new species under the name *Scirpus mirus*, Kukenthal.

It was found that the native flora had almost disappeared owing to the clearing of the land for building purposes, and other parts were fenced in for grazing paddocks.

Near the beach a few plants were found, including *Leucopogon Richei*, *Monotoca scoparia*, and *M. elliptica*, the latter just in bud, *Astroloma pinifolia*, *Hibbertia fascicularis*, *H. linearis*, *Persoonia lanceolata*, *Aotus villosus*, and *Lepidosperma concava*. The last mentioned species was particularly interesting, as the stamens are the only showy part of the flowers, and the golden or orange-coloured anthers attracted the attention of the members.

Altogether the afternoon was an enjoyable one, and finished up with the usual picnic.

—E.C.

NOTES AND COMMENTS.

NOTE ON "GOO-GOO-GA-GA" (LAUGHING JACKASS) FROM WIRRABILLA.—At the monthly meeting on 6th May, Mr. David G. Stead, F.L.S., exhibited an example of the Laughing Jackass (*Dacelo*) and contributed the following note thereon:—"The specimen shown was obtained by me at Wirrabilla, a few miles from Collarenebri (on the Barwon River), during May 1910. It was young at the time and had only a short time before been taken from the nest. It has been kept as a pet ever since, until the middle of last month (about 3 years) when it died. Though it has never been caged it did not, until recently, obtain the full use of its wings; the fea-

thers of which kept somewhat worn through the bird always living on the ground. The wings developed properly about three months ago, but the bird made no attempt to fly away. During the whole period that the bird was in my possession it was fed on raw meat, varied every now and then with sparrows, starlings, rats and mice, and it is interesting to note that *it has never had a drink of water during the whole period*. It seemed to show an aversion to water right from the start when attempts were made (failing the bird helping itself) to pour water down its throat. On each occasion that this was attempted, the bird would struggle and shake its head violently from side to side, both while it was being held, and after. It must needs, therefore, have utilised only the water present in the flesh of the meat, and of the animals, given to it as food. The native Australian name in the Col-larenebri district for this species is "*Goo-Goo-ga-ga*," which became the bird's pet name while it was in my keeping. The specimen is now undergoing a drying process after preservation by the formalin method."

DOLPHINS v. SHARKS.—One sometimes hears of battles between Dolphins and Sharks, but seldom obtains anything reliable relating thereto. The following occurrence, therefore, reported by a Fisheries Inspector, at Port Stephens, will be of general interest to naturalists and others.

On the 23rd. April, of this year, while the two Brothers Smithers were Dolphin-hunting near Broughton Island, they saw a big commotion in the water near the shore. On going closer to investigate, they found a large school of Dolphins or "Porpoises" (*Delphinus delphis*). These were attacking three very large sharks, each about 14 feet in length. Two of the Dolphins were harpooned and as soon as this was done, the sharks at once attacked them and kept eating them right up to the side of the launch. The lance was driven into these sharks several times, but the sharks did not appear to take the slightest notice of it.

In this connection it is of interest to note that the Dolphin-hunters captured 23 out of this school of Dolphins in the space of an hour. As far as I know, this is the first time in the experience of Dolphin-hunters on this coast that these cetaceans have been harpooned in such shallow water—about 4 fathoms—the Dolphins, as a rule, never rising to a launch in any but water of a good depth; say about 20 fathoms. The Dolphins are pursued at present solely for their teeth, which are used as currency in certain Pacific Islands. About 160 teeth are obtained from each individual.

DAVID G. STEAD.

DISTRIBUTION OF BUTTERFLIES.—Mr. G. A. Waterhouse gave an account, at the June meeting, of the variation and geographical distribution of Australian Butterflies. He pointed out that there were two very definite elements in the Australian Butterfly Fauna. One of these is centred in South Eastern Australia, where its maximum development occurs; this element gradually decreases to the northwards, and is very feebly represented at Cape York. A similar decrease takes place along the Southern Coast of Australia.

The other element in the Australian Fauna is a tropical one, and is derived via New Guinea across Torres Straits. This element is at its maximum at Cape York, and gradually decreases along the East Coast, and has almost disappeared in Victoria. It was pointed out that the East Coast of Australia could not be divided into definite faunal regions, as both the faunal element overlapped. A small invasion from Timor was shown to exist in the Northern Territory and N.W. Australia. Mr. Waterhouse's remarks were illustrated by numerous specimens of butterflies.

OSPREY PLUMES.

The Duchess of Portland writes to "The Times," August 23:—"My attention having been called to the fact that mounts of real osprey were recently advertised for sale, I beg that you will allow me through your columns to implore my countrywomen to refrain from purchasing this particular kind of headdress. I am afraid ladies are not generally aware of the dreadful suffering caused in procuring these feathers. The milliner's osprey (French aigrette) grows on the back of the white heron or egret, and then only in the breeding season, when their nests are congregated together in large numbers. Thus the birds, although alarmed on the approach of the hunters, are unwilling to leave their offspring, and fall easy prey to the guns, after which the coveted feathers are plucked from their bodies; but what of their young? They, cruelly deprived of their parental support, and having themselves no feathers of any value, are left to die the horrible death of slow starvation. These are the circumstances I wish to point out, and why I would ask all men and women to discourage the wearing of osprey plumes, for if there were no demand, the supply would soon cease. I am glad to read in a leading London newspaper, commenting on the millinery taken to India by Queen Mary, in the recent tour, that her Majesty had never worn a real aigrette, and had given special instruction that nothing of the kind should be employed in her millinery. This example will, I earnestly hope, be followed when the facts are known."

Several articles held over.—Ed.

THE
Australian Naturalist.

Vol. II.

OCTOBER 1, 1913.

PART 16.

NOTE.—Members having any matter of interest suitable for publication in these pages are requested to communicate with the Editor.

SPECIAL MEETING.

1st July, 1913.—Mr. T. Steel, F.L.S., in the chair. The Hon. Sec. read and explained the proposed alterations to the rules, suggested by the Council. It was resolved that the amended rules as submitted be adopted.

ORDINARY MEETING.

1st July, 1913.—Mr. E. S. Edwards, M.A. (president) in the chair. The following were elected members:—Misses A. Thompson and B. Ward.

A lecture entitled:—"The Stone Age and some superstitions connected therewith," was delivered by Mr. T. Steel, F.L.S. The lecture was illustrated with a large collection of stone implements from various parts of the world, including some very fine flint ones from Europe and America, and was highly appreciated and listened to with close attention.

Miss Bertha Fanning contributed a note and exhibited specimens illustrative of the life history of a moth, (*Chelepteryx Collesi*; Mr. D. G. Stead, F.L.S., a stone axe from Collarenebri, N.S. Wales, the native name being "yuen-doo." Mr. A. A. Hamilton, a note, illustrated with a fine series of mounted specimens of native plants of special interest on account of peculiar habits or adaptability for cultivation. Miss C. le Plaistrier, a specimen of fungus, *Polystictus xanthopus*, from Clarence River. Mr. E. Cheel, a series of specimens of a fungus (*Scleroderma flavidum*), showing different stages of development. At Hill Top and other places this fungus is known to bushmen as "Swagman's Puff Powder," the mass of spores being used for rubbing on chafed feet; also a small Scorpion from Hill Top.

ANNUAL MEETING.

5th August, 1913.—The President (Mr. E. S. Edwards, M.A.), in the chair. The following were elected members:—Misses Bayfield, Conn, E. le Plaistrier, Taylor, and Tweedale. The President delivered the annual address, entitled:—"The Naturalist, past and present." He briefly showed the condition of nature study from the earliest times to the great scientific awakening in Europe, then gave some details of early amateur naturalist work in N.S. Wales, finally laying special stress on the great naturalist modern movement in America

and Europe. The field work of the Peckhams and others in the United States, and of Fabre and his associates in Europe was referred to. Some remarkable experiments made by the advanced naturalists were cited by the lecturer. A full resume will appear in our next issue.

Mr. Finckh submitted the Annual Financial Statement which is printed on another page. This showed the Society to be in a healthy financial condition. The Annual Report of the Council was read by Mr. Cheel, and adopted. There being no extra nominations, the list of office-bearers submitted by the Council was put to the meeting, and carried unanimously. Mr. Edwards then welcomed the new President, Mr. A. G. Hamilton, who returned thanks for the honour conferred upon him.

Mr. A. A. Hamilton exhibited some interesting herbarium specimens and contributed a note thereon; Mr. W. W. Froggatt a fine series of fungi which he had recently collected in New Hebrides; Mr. Goldfinch a collection of insects; and Mr. A. Searle a small snake and insects.

ORDINARY MEETING.

3rd Sept., 1913.—Mr. G. A. Waterhouse, B.Sc., etc. (Vice-President) in the chair. The following were duly elected to membership:—Misses Perry B.Sc., R. Ling, S. Tresilian, Mrs. A. G. Foster, Mrs. C. R. Thornett, Messrs. L. Walker, G. Wilson, P. S. Graham, A. Searle, and E. J. Bickford.

The meeting was an open one for members to read short notes on Nature Study. The following members contributed notes and exhibits:—Mr. E. Cheel, fresh flowering specimens of *Leucopogon setiger*, *L. lanceolatus*, *L. ericoides*, *Hovea longifolia*, *Acacia longifolia*, *Logania floribunda*, all of which were found at Hill Top in beautiful masses of flower. Mr. Cheel also exhibited and contributed a note on *Hirneola polytricha*, the so-called "Jew's-ear" fungus. Mr. A. Gale, Golden Carp, having single, twin and fan-shaped tails all reared from the same parents. Miss F. Sulman, botanical specimens, from Queensland, with notes. Mr. C. H. Wickham, moths, with their life-histories. Miss C. le Plaistrier, primrose (*Primula vulgaris*), having the common peduncle much more elongated than usual. Mr. A. A. Hamilton, botanical specimens, with notes thereon. Mr. G. A. Waterhouse, an interesting specimen of *Taenaris*, in which the two usual large eye spots of the underside of the hind-wing were absent on the left side, though present on the right, also a bred female of the large *Troides goliath*, from Dutch New Guinea, and examples of *Delias aruna*, from New Guinea and N. Australia, showing their geographical differences.

ANNUAL REPORT, 1912-13.

The members of Council in presenting this first Annual Report of the reorganised Society, are glad to feel that in many ways the Society is prospering. With the incorporation of the Flora Society in August, 1912, and the Aquarium Society in February last, the membership of the Society has shown a satisfactory increase, 65 having been elected during the year. We have lost 1 through death, and 9 have resigned, leaving the total membership at 249.

It is with deep regret that we record the death of Mr. Ernest Bêche, Botanical Assistant in the National Herbarium, who passed away on June 28th.

Ten Ordinary Monthly Meetings and one Special Meeting have been held during the year, at which the papers and lectures have been most instructive and interesting and highly appreciated by the members.

The following lectures have been delivered during the year:—

Mosses of the Sydney District. Rev. W. W. Watts.

Miscellanea Entomologica. T. Steel, F.L.S.

Preliminary Notes on Myrmecophilous Lycanid Larvae.

G. A. Waterhouse, B.Sc., B.E., F.L.S.

The Making of the Coast Line of N.S. Wales. C. A. Sussmilch, F.G.S.

A Geologist's Expedition to Papua. J. E. Carne, F.G.S.

The Romance of Chemistry. J. M. Petrie, D.Sc., F.I.C.

Variations in Plant Life. E. Cheel.

The Geographical Distribution of Butterflies. G. A. Waterhouse, B.Sc. etc.

Some forms of Association amongst Plants. W. M. Carne.

The Stone Age. T. Steel, F.L.S.

The exhibits at the Monthly Meetings have again been an interesting and most attractive feature, and in several instances valuable notes have been read in connection therewith, and recorded in the Australian Naturalist. The excursions have been exceedingly well attended, and have been a source of much pleasure and profit to members and friends.

During the year the Council received with much regret the unavoidable resignations of the two Hon. Secretaries, Messrs. W. G. Davies and W. B. Gurney, to whose labours the Society is deeply indebted. We are also much indebted to our President (Mr. E. S. Edwards) for the attention which he has devoted to the welfare of the Society at both meetings and excursions. Our thanks are also due to the Hon. Editor (Mr. Steel) and to the Hon. Treasurer (Mr. H. E. Finckh).

Messrs. G. A. Waterhouse and A. G. Hamilton were appointed to act as delegates to the Melbourne meeting of the Australasian Association and Messrs. Edwards and Gurney

have been appointed representatives to the forthcoming meeting in Australia of the British Association. As this meeting, which will be held in August, 1914, will be a most important event in the history of Science in Australia, it is hoped that our members will do their utmost in every way to further the objects of the Association.

The Council has given attention to the formation of Student Branches and the resuscitation of Country Branches and arrangements have been made for the receipt of branch instead of individual subscriptions. It has also been arranged to assist the Girls' Realm Guild of N.S. Wales in their Wild Flower Show to be held in the Town Hall, Sydney, in September, 1914.

EDWIN CHEEL,
Hon. Secretary.

NOTES ON FLORA OF NEW ZEALAND.

By Miss F. Sulman.

New Zealand is noted for the great variety and beauty of its scenery, from the Kauri Forests, Hot Lakes and volcanoes of the North Island to the Glaciers, Sub-alpine Meadows, Cold Lakes, and Sounds in the South. It is not surprising therefore to find a very varied native flora among such extremes of climate and local conditions. A great proportion of the plants are endemic, which is probably due to the geological age, long isolation, and nature of the floras from which they originated. Australia and South America are considered the chief outside sources. An ancient land connection has been traced extending north-west by Norfolk Island and New Caledonia to Queensland, a route still used by migratory birds, and S. America is believed to have been connected by a sub-antarctic route.

The following interesting statistics are taken from the excellent "Manual of the New Zealand Flora" (1906) by T. F. Cheeseman, F.L.S., F.Z.S.

N.Z. has 1571 species,	1415 phænogams,	156 cryptogams
1143	„	or nearly $\frac{3}{4}$ are peculiar to N.Z.
366	„	extend to Australia
108	„	„ „ S. America
789	„	are found in both Islands
456	„	peculiar to South Island
219	„	„ „ North Island
107	„	„ „ outlying Islands

The family Compositae constitutes $\frac{1}{7}$ of the whole flora with 221 species (Celmisia 43 sp. Olearia 35 sp. and Senecio 30 sp.

The Scrophularinae has 113 species (Veronica 84 sp.).

"Plants of New Zealand" (1907) by L. R. M. Laing, B.Sc., is the well-known popular guide to the Flora, illus-

trated by fine photographs and arranged in a clear and most helpful style.

"New Zealand Plants and their Story" (1910) by L. Cockayne, Ph.D., F.L.S., is an exceedingly interesting book on the history and ecology of this varied flora. It is written in a popular style and well illustrated by excellent photographs, such a book for N.S. Wales would be invaluable for the spread of botanical interest and knowledge.

Dr. Cockayne roughly divides the flora of N. Zealand into Forests, Natural Shrubberies, Meadows, Swamps, and Sea-coast. The forests may consist of one kind of tree as the Beech or Kauri. A well-illustrated report on a Kauri forest has been written by Dr. Cockayne for the Government. The mixed forests are quite sub-tropical in character with a wealth of foliage, luxuriant creepers, and a dense carpet of ferns and moss; good examples are seen on the west coast of the South Island, and in the centre of the North Island.

The *Shrubberies* at the edge of the forests generally consist of many different species, Cabbage trees (*Cordyline*), Veronicas, Coprosmas, Olearias, etc. And in both Islands large tracts of poor country are covered with Manuka scrub (*Leptospermum scoparium*).

The *Meadows* are roughly divided into sub-alpine and lowland. The sub-alpine meadows are the "native gardens" of N.Z., being a mass of blossom in spring and summer with Celmiseas, Ranunculus, Ourisias, etc. The lowland meadows are mostly covered with the characteristic tussocks of grass, *Poa caespitosa*, etc., and form the natural pastures of N.Z.

The *Swamps* are the home of the native Flax (*Phormium tenax*), which is of such economic value to N.Z.

The *Seacoast* has its own peculiarities, which have been dealt with in a "Report on the Sand Dunes," by Dr. Cockayne.

CATERPILLAR OF CHELEPTERYX COLLESI.

By Miss Bertha Fanning.

A caterpillar of this moth, about 4 inches in length, was found descending the trunk of a Box Gum at Bolivia, N.S. Wales, on 7th December, 1912. On 23rd January following, another example was captured in a similar position, this one being 6 inches in length when crawling. After repeated futile efforts to escape from the box in which it was confined, this specimen commenced spinning on 26th January, but being disturbed, it commenced feeding again, eating Box leaves. Next afternoon it resumed spinning, and by 11 p.m. was completely surrounded with fine silken web. Next morning it was still at work, and by the afternoon, had apparently completed its task. I opened the end of the cocoon and soon afterwards its occupant repaired the damage. The same

evening the short black hairs which form the black bands round the body, were protruding from the lower and under part of case. By 7 o'clock of the 29th, the hairs were projecting all over the case, which was now quite opaque. These hairs, as is well known, readily pierce the skin when touched, and are difficult to remove. The moth emerged between 27th May and 4th June, and laid in all 325 eggs, dying on 5th June. The first-mentioned caterpillar, found on 7th December, died on 27th January. During the last few weeks it refused to eat.

SOME MISCELLANEOUS BOTANICAL NOTES.

A. A. Hamilton.

Phebalium Billardieri, Juss.—A handsome shrub of 8-12 feet, which is better worth the attention of the grower than many of the exotics cultivated in N.S. Wales. Its compact habit and quick growth (it reaches the full height in about 5 years) are both desirable qualities. The corymbs of star-like flowers which are produced in great profusion are pleasing, while the silvery texture of the underside of the leaves rivals that of the far-famed "Silver Leaved Tree" of Table Mountain, (*Leucadendron argenteum*), known to all travelers who have called at the "Cape." To these qualities may be added the perfume, which arises from the essential oil secreted in glands in the leaves and other parts of the plant, a character common to all the members of the Nat. Ord. Rutaceae, to which it belongs. Plants are easily raised from fresh seeds, and are hardy in the Port Jackson district. It is widely distributed in the coastal belt, North and South of Sydney, and is found in gullies on the Blue Mountains from Springwood to Mt. Victoria.

Punax cephalobotrys, F.v. M.—Most of our members have visited Katoomba Falls, and some, deviating from the main track have climbed up to the "Orphan Rock." It may not be generally known however that this by-track if followed a few yards further will bring us to the old tram line upon which the coals were hauled from the now disused mine. Anyone caring to follow the tram line down into the Miner's Glen may see this rare plant in situ. It is a Northern species and appears to have rarely been seen in any other locality.

Veronica Derwentia, Littlej.—A bright herbaceous perennial, which may be grown from seeds, or by division of the root clumps. Though hardly comparable with our shrubby garden varieties with their graceful particolored "Tassels," it should prove, with its long slender racemes of blue and white flowers, a desirable novelty for the herbaceous border. As it grows equally well in the colder parts of the State (Twofold Bay, Kiandra, and the higher parts of the Blue Mountains) as in the warmer districts (Richmond and Clarence Rivers), it is evidently adaptable to a wide range of

climatic variation. This plant prefers a moist shady position, and does its best work under bush-house conditions.

Fieldia Australis, Cunn.—A plant which, though not rare, is interesting as a monotypic species of a genus endemic in Australia, which, in its turn is the only genus representing the Nat. Ord. Gesneraceae in N.S. Wales. This semi-epiphyte is a shade and moisture loving plant, clinging to trees or damp rocks at the bottom of deep gullies. It may be seen to perfection near the "Tables" at the bottom of Leura Falls, scrambling about the rocks in company with *Rubus moluccanus*, L., one of our "Brambles." Attention is drawn to the plant by its peculiar foliage, the opposing leaves being unequal, the larger ones as much as 3 in long, while the smaller leaves in some cases do not exceed $\frac{1}{2}$ in. in length.

Myoporum debile, R. Br.—A small undershrub with a fairly wide range in N.S. Wales. It is not a showy plant, but its scattered, bell-shaped flowers and purple stems covered with glandular protruberances give it a somewhat novel appearance. This species was cultivated in England as a greenhouse subject, prior to the year 1820, by the firm of Loddiges and Sons, nurserymen, who were instrumental in introducing many of our Australian plants to British gardens. Grows freely from seeds and is hardy in the Port Jackson district.

Senecio vagus, F.v. M.—While collecting at Narrabeen, a plant was noticed which in habit seemed familiar, but the sparsely furnished flowers appeared out of place in the general ensemble. It proved upon examination to be a *Senecio*. By the usual process of elimination it was reduced to one of two species, viz.; *S. vagus*, F. v. M., of *S. amygdalifolius*, F.v. M. An important character by which these two species are separated (according to our "Botanical Classic," the Fl. Austr.) is the number of ray flowers, about 10 to 15 in *S. vagus*, and rarely 6 or often only 3 or 4 in *S. amygdalifolius*. The specimens under notice had invariably 8 ray flowers, a number exactly half-way between the maximum (6) of *S. amygdalifolius*, and the minimum (10) of *S. vagus*. Fortunately for the systematist there are other characters by which these two species may be distinguished, and the specimens were definitely placed under *S. vagus*. This is undoubtedly a case of the suppression of the ligulate lamina of some of the ray florets, known Teratologically as "Meiophylly of the Corolla," apparently arising from a lack of flower-producing nutrients in the soil. Evidence of this is given by the more or less attenuated condition of the remaining rays. This species grows freely from seeds and the flowers are not unattractive, but it is not a desirable subject for cultivation in our gardens on account of the unpleasant rancid odour which in common with many of its congeners is emitted by this plant.

BOTANICAL NOTES.

By A. A. Hamilton.

Grevillea acanthifolia, Cunn.—Though this prickly-leaved *Grevillea* exhibits a decided preference for the swamps in the higher parts of the Blue Mountains (the writer has not noted it at a lower altitude than 1500 feet), it is sufficiently adaptable to grow in the Port Jackson district if given a marshy environment. Some years ago plants were grown from seeds and the seedlings planted in a swampy situation in the Centennial Park on the Eastern side of the Waterlily Pond. The plants grew as large and flowered and fruited as freely as in their native habitat.

Corysanthes pruinosa, Cunn.—A diminutive terrestrial orchid, collected in densely timbered brush country in the Illawarra district. The hood-shaped, inflated flower has a striking resemblance to a snail, which is accentuated by its marking and its situation (the flower is almost sessile) on the appressed radical leaf. Benthani (Fl. Austr. 6.35) unites this species with *C. fimbriata*, R. Br., but Fitzgerald in his monumental work on Australian Orchids separates them, and figures both, giving a tabulated exposition of their differential characters. It has an exceptionally wide range, being found in Vic., Tas., S.A. and W.A.

Polymeria calycina, R. Br., Cooks River.—A plant not often collected, though perhaps not rare. Its resemblance to *Convolvulus erubescens*, Linn., in the field is so marked that even an observant collector might be excused for passing it by as that ubiquitous trailer, the principal point of difference being the number of stigmas, which are enclosed in the corolla and are not noticed until the flowers are examined.

Synoum glandulosum, A. Juss. "Dogwood." Scarborough, Illawarra.—The genus consists of a single species limited to Australia. It has a fairly wide range in the coastal area, North and South of Sydney, and is found inland as far as the Blue Mountains. On the coast it frequently occurs on the bluffs overhanging the ocean, the specimens exhibited being taken from such a position. The ovary of this species would well repay the attention of any student who could devote the time necessary for an exhaustive study of its functions. The seeds, two in each cell, are attached by a broad lateral hilum, and half embedded in a fleshy, orange-colored arillus, formed by the enlarged placenta. Mr. Maiden in his "Useful Native Plants of Australia," gives the aboriginal name of this plant in the Illawarra district as "Wallaon."

Wilsonia Backhousii, Hook. Cooks River.—A low, decumbent plant with a creeping rhizome, growing in masses in salt marshes. The foregoing characters are a palpable adaptation to an unstable environment. The low growth,

underground stem, and assemblage in masses, are powerful aids to the plant in its resistance to tidal invasion. On first acquaintance one would hardly suspect such a degenerate of belonging to the Convolvulacea and claiming relationship to the 'Morning Glory' (*Ipomea purpurea*, Roth.) and the noble array of bold brilliant climbers which largely constitutes the membership of that Nat. Ord.

Eriostemon myoporoides, D.C.—A shrub which deserves a larger representation in our gardens than it is accorded. It is a shapely bush of from 3 to 6 feet, and in the flowering season literally covers itself with a wealth of pink and white blossoms, similar to those of its smaller and better-known coastal congeners, *E. buxifolius* (which loves the tang of the salt breeze), and *E. scaber*, usually found a little further inland. The nearest patch of *E. myoporoides* known to the writer is at Emu Plains. The shrubs flower early in October, and wishing to collect seeds, two months was allowed for their ripening. This proved rather early, but a few apparently unripe seeds were collected, and sown. A week later a second visit was paid, but during that short period all the fruit carpels had ripened and burst (the fruits of this genus belong to the explosive group) scattering the seeds. These appear to be the favorite food of some member of the animal kingdom, as less than a dozen seeds were the reward of a couple of hours search, though some millions had been shed. Fortunately the supposed unripe seeds germinated, and it was afterwards found that they gave better results if collected just as they commence to color, or in any case before the varnished testa becomes quite black. The seedlings are hardy and give little trouble in transplanting. Allan Cunningham found plants of this species growing near Cox's River and forwarded seeds to Kew, where plants were grown and flowered about 1823. It was named *E. cuspidatum* by Cunningham, who of course was not aware that it had been published a year previously by De Candolle under its present name.

JEW'S-EAR FUNGUS.

(*HIRNEOLA POLYTRICHA*, MORT).

By Edwin Cheel.

The fungus commonly known as "Jew's-ear Fungus" is fairly common in the coastal districts of New South Wales, but it is not generally known that it is of commercial value.

In the Sydney Botanic Gardens and in the Government Domains as well as the Parks and Gardens in the Suburban Districts, it is frequently found in fairly large clumps on the dead branches of *Ficus macrophylla*, *Erythrina indica* and occasionally on other species of plants.

It is also quite common in New Zealand, Lord Howe and Norfolk Islands, and from these places, especially from

New Zealand, quite a lot of money is turned over in exporting the dried fungus to China. It has been reported by Simmonds, that "of this edible fungus, in 1871 alone, the quantity exported from Tahiti to China represented a value of £7,600.

Sir James Hector also reported that the export from New Zealand in 1885 to China was 6,389 cwt. valued at £11,079.

In Grevillea vol. X., p. 59, under the heading "A Curious Trade in Fungus," it is stated that from Taranaki, N.Z., 58 tons valued at £1,927 was shipped to China in 1872. In 1877, 220 tons valued at £11,318, and 1880, £6,227 worth was shipped to China.

In Lloyd's Mycological Notes, No. 37 (1911), a further reference is published as follows, which is taken from the "Taranaki Herald," Taranaki, New Zealand. "From 1870 to 1903 the Customs return of New Plymouth, N.Z., show that £305,995 was used in the actual purchase of the stuff from settlers. In addition to this sum an equal amount was spent in labour in packing and in freight. In 1903, Mr. Chong (a Chinese merchant, who specialised in the product) went to China, and the fungus business lapsed for a time; but from 1904 to 1909 £58,793 was paid. This with labour and freight, has caused a total circulation of £700,000 in forty years—surely a very considerable worth for one man." The species mentioned by Lloyd is *H. Auricula-Judae*, but it will probably be found that *H. polytricha* is the most common species exported.

EXCURSIONS.

MAROUBRA BAY.—On 7th June, the members led by Mr. T. Whitelegge, visited Maroubra Bay for the purpose of collecting Aboriginal Stone Chippings and other relics. A very profitable afternoon was spent amongst the sandhills, and under Mr. Whitelegge's guidance a considerable number of excellent flakes and varied small implements were obtained.

T.S.

ZOOLOGICAL GARDENS.—On the afternoon of 5th July, the members visited the Zoological Gardens, about 80 being present. The Director, Mr. A. S. le Souef conducted the excursion. Some interesting Wallaroos and Phalangiers were examined, which had been obtained from Cobar, N.S. Wales; Broome, W.A.; and the coastal districts of northern N.S. Wales and of Queensland. Some of these may require to be separated as sub-species as the colour varies from white to various shades of dark or rusty-brown as compared with the ordinary silvery-grey. A beautiful Bird of Paradise and a Lyre Bird were shown, the latter having been in captivity for over six months; it is fed on ant-larvae and hard-boiled eggs, as well as white ants. Mr. le Souef drew attention to

about 50 specimens of Chameleon from Madagascar, which showed to perfection the remarkable power of colour change. Some Giant Toads from Japan were fond of garden snails, and on this account might prove useful. At the close of the excursion the party was entertained to afternoon tea by Mr. and Mrs. le Souef, when the hearty thanks of the members were tendered to Mr. le Souef by the President (Mr. Edwards). E.C.

KURNELL.—On Aug. 9th, the usual monthly excursion was held at Kurnell (Capt. Cook's landing place). There were upwards of 95 present. Near the homestead a number of "Wattles" have been planted. *Acacia spectabilis* was covered with a glorious wealth of golden trusses, while a number of other species were also in bloom. A Native Heath (*Epacris longiflora*) was in full flower, some of the trusses of bloom being white instead of the usual pink. Some fine shapely trees of *Banksia integrifolia* were noted, suggesting the suitability of this species for cultivation as an ornamental tree. Different species of *Hibbertia*, mingled with *Lysinema pungens*, *Leucopogon esquamatus*, *L. ericoides*, and the more stately *Monotoca elliptica* were all in beautiful flower. *Eugenia cyanocarpa* was noted, this plant, we believe, not having been previously found nearer than National Park. Pods of *Bossiaea heterophylla* infested with *Aecidium eburneum* were found, also several Orchids including *Caladenia alba*, *Pterostylis nutans*, and *Thelymitra ixioides*. Altogether 72 species were identified. Afternoon tea kindly prepared by Mrs. Finckh and Mr. E. S. Edwards, brought to a close a most delightful and profitable excursion. E.C.

Oatley.—Foremost amongst the plants met with at Oatley on Sept. 6th were *Eriostemon scaber*, which was in profusion, as was also *Ricinocarpus pinifolius*. *Daviesia corymbosa*, *Pultenaea daphnoides*, *Tecoma australis*, *Hibbertia bracteata*, and *Pomaderris ferruginea* were out to perfection. Two interesting plants, *Mitrasacme polymorpha* and *Pomax umbellata*, were also noted, as was *Omphacomeria acerba*, which resembles the native currant *Leptomeria acida*. Some of the plants were laden with flowers and fruit, while others had in place of the fruit a heavy crop of insect galls.

N. F. BLAKELY.

NOTES AND COMMENTS.

THE LATE MR. E. BETCHE.—It is with regret that we record the death since our last issue, of this gentleman. Mr. Betché was for many years employed at the National Herbarium, Sydney, where he did much taxonomic work of a high order of merit. In a recent number we published his "Key to the Goodeniaceae," which is one of the last pieces of work which he carried out for publication.

TEMPORARY STERILITY IN RAINBOW TROUT.—While on a visit to Jenolan last June, I had an opportunity of adding to

some previous observations of a curious phenomenon in connection with the spawning of the Rainbow Trout.

A sexually mature female measuring 14in. in length (a fish which was probably even mature in the previous year), was opened by me and was found to contain ova in the very earliest stages—chiefly less than a millimeter in diameter. I should say that there was no likelihood of this fish spawning during the ensuing season; nor did it seem that she had spawned in the preceding season, as the ovaries were in very nearly the same early developmental stages which one finds even in yearlings (allowing for difference in size of the fish).

The fish was quite normal-looking, was not diseased or unusually parasitised, and there appears, therefore, to be no reason why it should not ultimately have spawned—perhaps in the next season. Therefore, and though there has been some doubt, I have set this down at present as merely temporary sterility.

It may be mentioned in this connection, that recent observations carried out in Britain have shown that individual Salmon (*Salmo salar*) frequently do not spawn annually, and that, apparently, they may even go for two or three years without spawning.

As the occurrence or otherwise of this phenomenon is of great importance to fish culturists, close observations will be made with our Trout in this and succeeding spawning seasons.

DAVID G. STEAD.

BALANCE SHEET, YEAR ENDING 31ST JULY, 1913.

RECEIPTS.		£	s.	d.
To Balance	...	61	16	2
„ Flora Society	...	28	16	4
„ Aquarium Society	...	3	19	10
„ Subscriptions	...	61	4	9
„ Advertisements in Journal	...	5	0	0
„ Interest Savings Bank	...	2	14	3

£163 15 10

DISBURSEMENTS.

By Rent of Hall	...	10	5	0
„ Printing Journal	...	31	13	6
„ Typing and Posting Notices, Journal, etc.	...	20	5	9
„ Postages and Petty Cash	...	6	19	3
„ Balance in Bank	...	92	11	0
„ Cash in Hand	...	2	1	4

94 12 4

£163 15 10

Examined and found correct.

C. H. WICKHAM

A. S. le SOUEF

Hon Auditors.

H. E. FINCKH,

Hon. Treasurer.

